SPECIAL ELECTRIC STREET RAILWAY EDITION.—I.

ILLUSTRATED ELECTRICAL REVIEW

A Journal of Scientific and Electrical Progress.

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VIEWS, NEWS AND INTERVIEWS.

There is an electric club at Sidney, New South Wales. Ex-members of the New York Electric Club should make a note of this and call when in that vicinity.

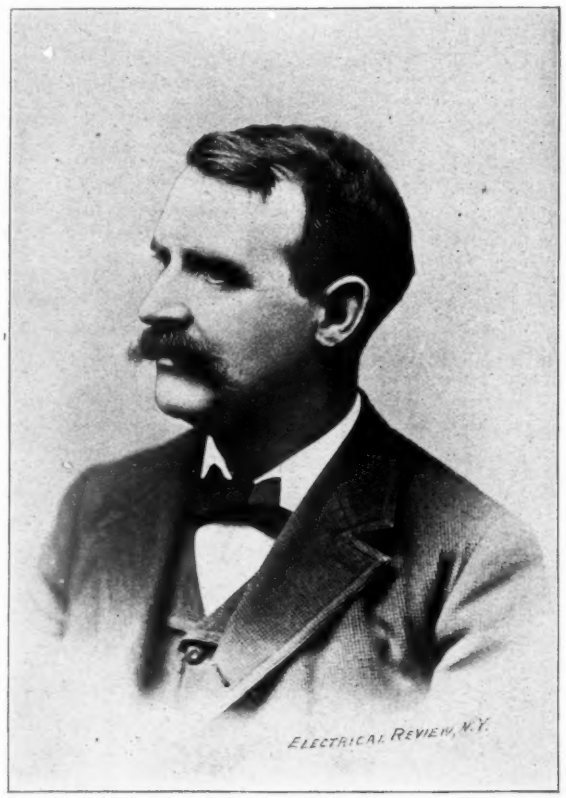
A French engineer has observed that the principal seat of decay in telegraph poles is in the 10 inches or 12 inches of the pole immediately below the surface of the ground. To protect them here he proposes to excavate the soil to this depth around the pole, to clean it thoroughly from soil and all decaying wood, and then to give it a coat of hot tar. The pole is then surrounded by a sleeve of glazed earthenware, which is made in semi-cylindrical halves, to facilitate the putting in place. The annular space between this sleeve and the pole is then filled with some dry material, which is finally capped with a waterproof layer of asphalt or some similar material. The cost is said to be about 50 cents per pole.

The City of London Electric Lighting Company has on exhibition an electric kitchen in Queen street, E. C. Favored guests are invited to partake of electrically cooked meals and to inspect the advantages of electricity for cooking. In electric cooking convenience and not expense should be considered.

A respectably dressed man delivered a package for a manufacturing company to the Correspondence School of Technology at Cleveland, Ohio. A gentleman connected with the school asked him if he was connected with the concern that sent the package. He stated that he did more or less work for them, and when asked as to the character of his work, he answered that he did drawing. After the gentleman had spent considerable time showing him the benefits of the Correspondence School, he discovered that the character of drawing done by his visitor was in the line of an express wagon.

The Laclede Gas Lighting Company, of St. Louis, is experimenting with underground wires. Three-inch pipes near the street curb, below the frost line, are being tried.

The West End Street Railway Company, of Boston, is about to put into service two special cars which it has manufactured for the use of private theater parties and such other service as the public may desire. The cars are finely upholstered, contain 20 theater seats each, and can be rented by the day or evening for travel at will over any part of the system.



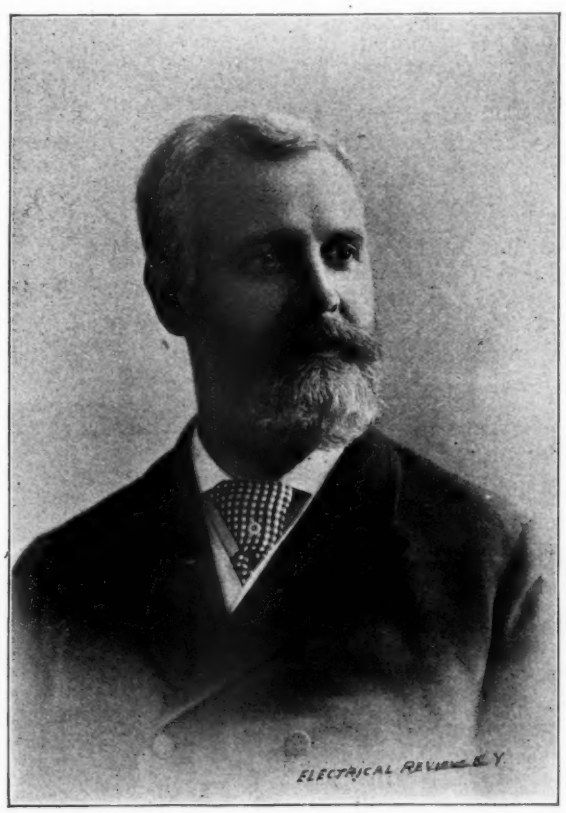
MR. HENRY C. PAYNE, MILWAUKEE, WIS., PRESIDENT AMERICAN STREET RAILWAY ASSOCIATION.

WELCOMED TO ATLANTA.

KIND AND COURTEOUS WORDS OF HOSPITALITY FROM GOVERNOR NORTHEN, EDITOR CLARK HOWELL AND OTHERS.

STREET RAILWAY OFFICIALS ASSURED A PLEASANT AND INTERESTING SOJOURN IN THIS PROGRESSIVE SOUTHERN CITY — NUMEROUS SPECIAL TRAINS CARRYING DELEGATES AND VISITORS—EXPOSITION HALL CROWDED WITH EXHIBITORS — SEVERAL ADDITIONS TO AN EXCELLENT PROGRAMME—CITY OF ATLANTA.

The ELECTRICAL REVIEW presents below, with unfeigned pleasure, the kindly sentiments of Southern welcome extended by eminent citizens of Atlanta. The words of courtesy and



MR. WILLIAM J. RICHARDSON, BROOKLYN, N. Y., SECRETARY AND TREASURER AMERICAN STREET RAILWAY ASSOCIATION.

cheer will be read with interest by the large and wide-awake gathering of traction representatives which convenes within the hospitable borders of the progressive State of Georgia.

FROM THE GOVERNOR OF GEORGIA.

STATE OF GEORGIA, EXECUTIVE OFFICE,
ATLANTA, October 5, 1894.

TO THE EDITOR OF ELECTRICAL REVIEW:

I avail myself very readily and willingly of the opportunity you offer me to extend, through your valuable REVIEW, a most hearty welcome to the members of the American Street Railway Association, who will meet in this city on the 17th of this month.

These gentlemen will be welcome to Atlanta and to Georgia not only because they represent the greatest civilizer and benefactor of the modern world, applied electricity; but because they are visitors to our homes, and we delight in extending our hospitality to all comers, believing that it is more blessed and more pleasant to give than to receive.

But we must look upon them as the torch-bearers and star-bearers of modern civilization. The power they control has annihilated time and distance; has made the distant near, and drawn the whole world into a close bond of fellowship, because it has brought the whole world into touch and communion. This power has made it possible for men of affairs to reside miles away from their places of business, where they could enjoy health and comfort that is hardly possible in great cities, and yet be at their desks within a few minutes after leaving home.

By such means it has increased human comfort, health, happiness, and has increased in a tremendous degree the facilities for the conduct of business. It has been the greatest factor in the recent advance of the world. It has rescued man from both the darkness of night and the darkness of superstition and barbarism.

We welcome the members of the association, therefore, in a double sense. We shall be glad to entertain them as our guests in this city and State, and as our enlighteners and the lighteners of our burdens. Very truly, etc.,

W. J. NORTHEN,
Governor.

FROM EDITOR CLARK HOWELL, OF THE "ATLANTA CONSTITUTION."

OFFICE OF MANAGING EDITOR
"THE CONSTITUTION."

TO THE EDITOR OF ELECTRICAL REVIEW:

The city of Atlanta looks forward with much pleasure to the annual convention of the American Street Railway Association. There is a warm welcome in store for every delegate, and we want the members to feel that they have made no mistake in selecting Atlanta as the place of meeting of this distinguished Association. We are delighted to hear that such a representative attendance will be on hand. We propose to show them the liveliest of all Southern cities and will extend the right hand of fellowship after the Atlanta fashion.

Arrangements have been made for the appropriate entertainment of all the guests, and I am personally delighted to know that you will be one of the number.

I am sure that the meeting of the Association will mark an epoch in street railroad development, and the proceedings will thus be of interest not only to the Association but to the whole country, which naturally watches with keen interest the wonderful progress in street transportation.

With a warm welcome in behalf of the newspapers of Atlanta to every member of the Association, I am, very truly yours, CLARK HOWELL.

Atlanta, Ga., October 5, 1894.

The *Atlanta Constitution*, in speaking of the convention, says:

"The American Street Railway Association is rapidly assuming an importance and a magnitude that places it among the leading organizations of this country and predicts for it, at the same time, a much larger and more extended field of usefulness. It has already outstripped the expectations of its most enthusiastic promoters, and far more has been realized than was even conjectured as a possibility.

"This will be the first meeting of the Association ever held in the South, and the street railway men throughout the country will be glad of an opportunity to visit this section. The fact that the convention is to be held in Atlanta, the representative city of the New South, and the site of the great international exposition, lends an additional interest and charm to it.

"It will bring to this city one of the largest convocations of wide-awake, enterprising and public-spirited business men that Atlanta has ever had the pleasure of entertaining within her gates, and it goes without saying that she will entertain them in her characteristic and open-handed hospitality."

ATLANTA.

A FEW WORDS ABOUT THE CITY—ITS REMARKABLE GROWTH AND DEVELOPMENT—THE MEN YOU WILL MEET THERE AND THE WARM WELCOME YOU WILL RECEIVE.

The selection of Atlanta as the meeting place of the 13th annual convention of the American Street Railway Association was a particularly fortunate one in many respects, and the meeting which convenes here on the 17th will stand on record as the largest and most successful in the history of the Association. This success will be largely due to the untiring efforts of the representative business men of the city, who have entered heart and soul into the spirit of the occasion and spared neither time nor money to make the event a memorable one, and the name of Atlanta one long to be remembered as the home of Southern chivalry and unbounded hospitality.

Atlanta is rightly called the Gate City of the South, and is to-day the center of commerce, the home of art and politics, and the head of all that stands for advancement and business enterprise within the Southern borders. It is beautifully located on a spur of the Blue Ridge mountains, and has an elevation of nearly 1,100 feet. The climate is delightful, the air pure, and the temperature remarkably even, all of which combines to make it one of the most healthful cities in the country.

Atlanta was first settled in 1836, and its population at that time consisted of one whole family, whose homestead was made the terminus of the Western and Atlantic Railroad, and from which it received its original name of Terminus. In 1843 the name was changed to Marthasville, and in 1847 to Atlanta. From this time on the population gradually increased until, in 1860, it numbered 12,000. From 1860 to '64 Atlanta had her full share of the disastrous usages of war, but in spite of all this maintained its upward growth and during this time increased its population to 20,000.

In September, 1864, the business portion of the city was almost entirely wiped out; but from the ashes of the old town a new one raised its head, and with its growth began the revival of trade and development of enterprise which have to-day put Atlanta in the front rank of the cities of the South.

The street railway systems of Atlanta date from 1871, when the first company, known as the West End road, was incorporated with a capital of $20,000. Of this, $10,000 was subscribed and $10,000 more added by Col. S. W. Adair, one of the heads of the enterprise. From this time on the growth of the street railways was fairly rapid, under the disadvantages of mule power, until 1888, when the first electrical equipment made its appearance. A number of roads had been built in the meantime, and had encountered the usual vicissitudes which street railway work is heir to, struggling along as best they could toward that goal of success which even in the darkest moments they felt would eventually be within their reach. In 1891, just 20 years after the first road was started, this goal was reached in the consolidation of all the existing lines under the head of the Atlanta Consolidated Street Railway Company.

Heroic efforts were necessary to bring order out of the existing chaos, to reconstruct the various lines, lay new track and connect the outlying roads into one coherent system. Engineering ability, time, money and patience were required, but all of these were furnished by the men in charge, and to-day they have a perfectly equipped and managed system, comprising 64 miles of track and one of the leading industries of the city.

First and foremost among the prominent railroad men who will welcome the delegates on their arrival is Joel Hurt, president of the Consolidated. Mr. Hurt was the prime moving force in the organization of the Consolidated, and to his personal efforts much of its success is due. He is largely interested in real estate and financial operations, and is one of the pre-eminently successful men of the city. Mr. H. N. Hurt, superintendent of the Consolidated, is another of the local committee who will extend a hearty welcome to the visiting delegates, and he will be ably seconded by N. W. L. Brown, also of the Consolidated, and chairman of the committee on exhibits.

The man who has probably done more than any other single individual for the comfort and welfare of the delegates is W. W. Kingston, Southern representative of the Johnson company, of Johnstown, Pa. Mr. Kingston is an enthusiast on street railway matters and one of the most active of the reception committee. He has devoted his entire time for some weeks past to the practical and very necessary duty of comfortably housing the visitors, and has personally made arrangements for the care of over 500 of them.

Jas. W. English, Jr., another of the committee, is one of the leading society and business men of Atlanta, and is at present manager of the Chattahoochie Brick Company, a trustee of the Grady Hospital and interested in several other important enterprises.

Capt. Henry Jackson and J. Carroll Payne are two of the legal luminaries of the South. Both are members of the board of directors of the Consolidated, and are interested in some of the leading business enterprises of the State.

R. J. Lowry is another of Atlanta's wealthy and public spirited citizens who is interested in the success of the convention. President of the Lowry Banking Company, the Atlanta Home Insurance Company and the Georgia Trust Company, as well as director in half a dozen other large corporations, he will still find time to extend a hearty welcome to the delegates, and to contribute to their entertainment.

Major Livingston Mims, president of the Capital City Club, in whose beautiful club house on Peachtree street a reception will be held on Wednesday evening, is also a member of the reception committee, and one of Atlanta's representative men.

S. W. Trawick, of the General Electric Company, J. H. Allen, manager of *Dixie*, S. M. Inman and A. F. Giles are also among those whose active interest has been exerted on behalf of the convention, and who will help to make things pleasant.

Piedmont Park, where the convention proper will be held, is just outside the city limits, but easy of access by the lines of the Consolidated road on the boulevard and also on Peachtree street. The park comprises 189 acres of ground, and contains the mile track, grand stand, club houses and stables of the Gentlemen's Driving Club, besides 10 spacious buildings for exhibition purposes.

Machinery Hall, in which the convention will be held, is 392 x 74 feet. Seventy-three square feet of this space has been divided off and a rostrum erected, and here the business of the meeting will be conducted. The balance of the building will be devoted to the exhibits, of which a larger line and variety will be displayed than ever before.

There are a number of points of interest in Atlanta and vicinity, which many of the delegates will be glad to visit, the most prominent among them being the Capitol, Governor's Mansion, Grant Park and Inman Park, Ponce de Leon Spring, Little Tyrol, Fort McPherson and Fort Decatur, the Grady Monument and the old Capitol.

Atlanta is also proud of her educational institutions, which are the finest in the South, and a brief visit to some of them would be time well spent. The leading clubs of the city are the Capital City, the Commercial, Concordin and Piedmont. Delegates may be sure of a warm welcome at any of them.

The electric power houses, in which, of course, considerable interest will be felt, are those of the Georgia Electric Light Company, the Atlanta City Power House, the Traction Company's station and the station of the Consolidated road, or what is called the nine mile circuit. A ride over this circuit, by the way, will prove very interesting, as will also a run over the Traction company's line to the Chattahoochie River, where the outlying cotton fields may be seen and where picking is now going on.

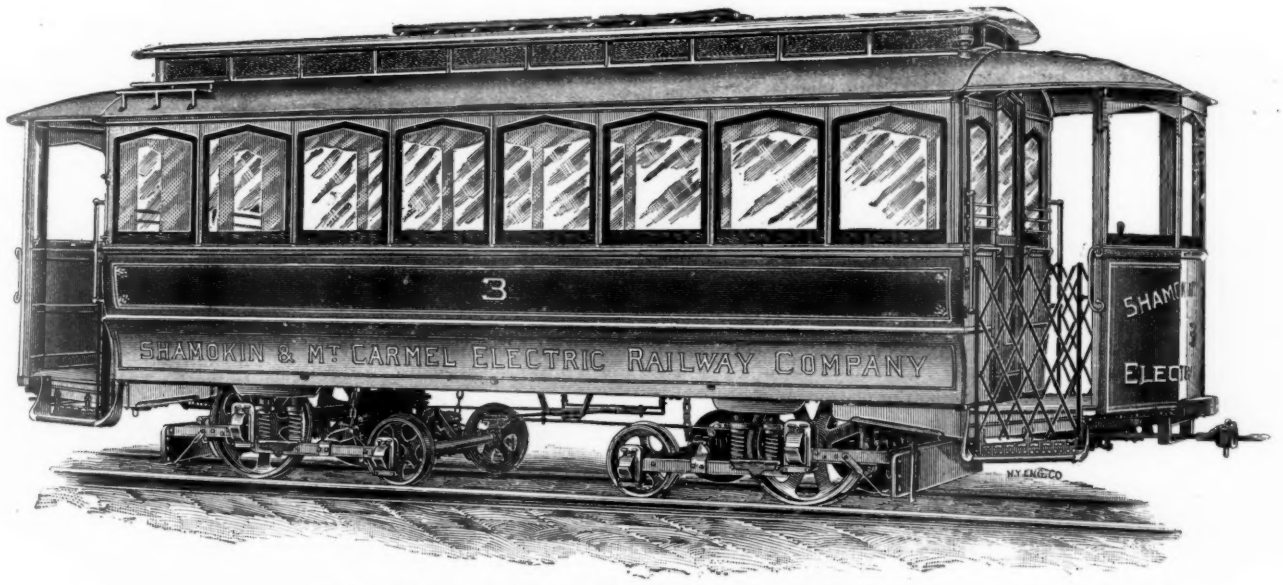
A long and interesting programme has been prepared by the local committee, and the time of the visitors will be fully occupied. They will need to be up early and late to participate in all the good things that will be offered them.

The press of this city, particularly the Atlanta *Constitution*, have taken a deep interest in the occasion, and exerted themselves in every way to contribute to the success of the meeting. The writer desires to express his appreciation of the many courtesies extended by City Editor R. L. Adamson and Remsen Crawford, of the *Constitution* staff. These gentlemen may rest assured, together with all those who have so cordially devoted their best efforts to the success of the meeting, that Atlanta and her sons will long retain a warm corner in the hearts of those she has so highly honored. H. G. T.

Atlanta, Ga., October 12.

J. G. Brill Company's Twenty Foot Vestibuled Electric Car.

The latest pattern of 20 foot vestibuled electric motor car body made by the J. G. Brill Company, Philadelphia, is shown in the accompanying illustration. There is nothing particularly distinctive regarding this car as it is about a standard. It is 20 feet long in body, having vestibuled ends sheathed on the outside with sheet steel. The inside finish is in palace No. 2 with solid cherry wood, carpet on seats and backs and decorated veneer ceilings. The car body is mounted on Brill's Eureka maximum traction truck about which there is something distinctive. These trucks are built under patents granted to Mr. John G. Brill, and for pivotal trucks they have had more success, it is claimed, than any truck which has yet been brought before the street railway fraternity. They are so designed that from 80 to 90 per cent of the weight comes on the driving wheels, thereby utilizing almost all of the electrical energy. The pivotal center of the truck is within a periphery of the driving wheels, so that in passing through curves the driving wheels radiate themselves between the sills and the first stringers of the car bottom, while the trail wheels being of smaller diameter radiate clear of the car body. In this way a minimum height of the car is arranged. The truck frames are a solid piece and the brake mechanism is so designed that power applied to the brake shaft will lock all eight wheels of the brake at one time, that is, of course, when the power exerted is sufficient to lock any of the wheels.



THE J. G. BRILL COMPANY'S TWENTY FOOT VESTIBULED ELECTRIC CAR.

The Moore Electrical Company.

Last week the Moore Electrical Company was incorporated under the laws of New York State. The directors are Leopold Wallach, the prominent counsel for several trunk lines; Joseph Livingston, the banker; Edward J. Wessels, general manager of the Genett Air Brake Company, and Mr. Moore, the inventor. For the past five years Mr. Moore was an engineer for the Edison, Thomson-Houston and General Electric companies. On October 1 he tendered his resignation and is now devoting his entire energies to developing the business of the Moore Electrical Company. The new company has secured all the patents owned jointly by Messrs. Wessels and Moore, and an excellent laboratory has been placed at Mr. Moore's disposal.

ELECTRIC RAILWAY DEVELOPMENT.

NEWS OF INTEREST IN THIS GREAT INDUSTRY FROM ALL PARTS OF THE UNITED STATES.

Boston is to have an electric railway mail service.

Work on the trolley line at Middletown, Conn., has commenced.

Beverly and Gloucester, Mass., are to be connected by an electric road.

The electric road from Pittston to Scranton, Pa., will soon be running.

An electric railroad is projected between Deposit and Trout Creek, Pa.

In two weeks a through line of trolley cars will run from the Hartford, Conn., City Hall to Unionville, Conn.

The North Jersey Traction Company's application to the Caldwell borough council for a franchise has been granted.

According to ex-Judge J. Frank Fort, the trolley companies of New Jersey have power to carry freight on their cars without asking anybody's permission.

Formal possession of the West Side electric line to Charlotte has been taken by the Rochester, N. Y., Railway Company.

The Massachusetts Railroad Commissioners have approved the issue of additional capital stock to the amount of $64,000 by the Brockton Street Railway Company.

At a recent session of the Common Council at Delavan, Wis., the request for a franchise by Chicago parties to build an electric railway to Delavan Lake was voted down unanimously.

Work on the construction of the Columbus, Hocking Valley and Athens, Ohio, Railway will begin this week, and a large force is to be employed as long as the weather will permit.

The new Millvale, Etna and Sharpsburg, Pa., Electric Railway has been opened for traffic. It connects with the line of the Alleghany Traction Company, formerly the Transverse, of Pittsburgh.

The failure of the interurban electric railway franchise to pass at the last meeting of the Appleton, Wis., council, when only a bare quorum was present, has not killed the project. The popular sentiment is overwhelmingly in favor of the road.

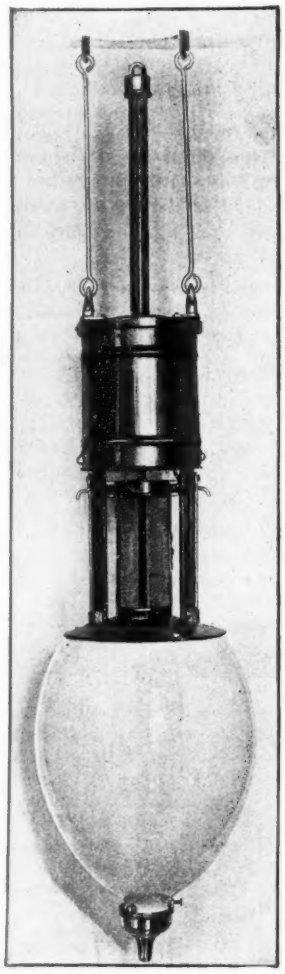
It appears that there is no city ordinance in New Orleans, La., which requires that the electric railway cars shall sound an alarm when approaching street crossings and sharp curves. The slow mule, when propelling a street car, is obliged always to tinkle his bell.

The plan of employing street cars for postal service in the large cities will not be applied, so far as New York city is concerned, until it shall have been tried in places like Chicago or Indianapolis, whose configuration approaches more nearly to a square. Second Assistant Postmaster-General Neilson said last week that the chances were that New York would be obliged to wait some time before getting an opportunity to pass judgment upon this interesting experiment.

A report highly favorable to the construction of an underground electric railway in New York city has been made to the Rapid Transit Commission by Engineer William B. Parsons after an examination of street railway systems in London, Glasgow and Paris. The engineer's conclusions are: "That the underground railway can be safely constructed without endangering abutting buildings, and that the cost can be determined in advance within reasonably narrow limits; that such a railway can be economically operated by electricity, which power will move the trains as fast as can be done by steam locomotives; that an underground railway so operated will have a perfectly satisfactory atmosphere, unlike any railway tunnel in operation. The atmosphere would be pure and clear, being entirely free from smoke, and the structure, by means designed especially as to the stations with architectural skill and being always well lighted, would be attractive in appearance."

The Thomson Alternating Current Arc Lamp.

To satisfy a demand that has become crying, the General Electric Company has placed upon the market a modification of the Thomson '93 arc lamp,



The Thomson Alternating Current Arc Lamp.

adapted to the alternating current circuit. To bring this lamp to its present condition has taken months of experiment, but the result is such as should render alternating current arc illumination equal to that by the continuous current arc lamp, whether for indoor or outdoor service.

With the Thomson '93 alternating lamp no external resistance is employed; the feeding mechanism is positive, the parts durable and interchangeable and the regulation perfect. In principle the feeding mechanism is a rack rod and escapement operated and controlled by an entirely new method. The rack rod is free to move in both directions without strain on the escapement. The arc is started with none of the "jumping" so noticably objectionable in many alternating arc lamps. The mechanism is simple in the extreme, and requires no adjustment before installation. All the different styles of lamps, standard, short, focusing, etc., are provided with reflector and spark arrester. The globes may be lowered rapidly and the carbon dust speedily removed.

These alternating arc lamps of a nominal 2,000 candle-power are designed for a current of 13 amperes, and are adjusted for that current, unless otherwise desired, to be connected in parallel on 32 volt circuits. Each is an absolutely independent unit. The 32 volts can be obtained from the secondary of the transformer, and such transformers, wound for 32 volts in the secondary, and of desired capacity, will be furnished by the General Electric Company.

With any alternating current arc lamp the exclusive use of cored carbons designed for alternating current lamps is essential. With the standard lamp, nine and one-half inches by seven-sixteenth inch or one-half inch cored carbons are used, giving a life of from 9 to 10 or 11 to 12 hours respectively. With the short and focusing lamps, if about the same life is required, seven inches by nine-sixteenth inch cored carbons are used. American uncored carbons, or even common cored carbons, designed for direct currents, cannot be used, and, moreover, their use would prove very expensive because of the increased potential which they would require (over that required for soft carbons) when used for alternating current work.

The General Electric Company at the Atlanta Convention.

The exhibit of the General Electric Company at the Atlanta Street Railway Convention will be of an elaborate nature. It will comprise motors, controller, other car equipment parts, station switchboard panels, line material, wattmeters, etc.

The G. E. 800 motors will be shown not only in the exhibit proper, but, mounted on cars, will operate them over the lines of the Atlanta Street Railway Company. Ample opportunity will be afforded for a close and critical examination of these motors and of the component parts which enter into their construction. The motors, shown in operation, will act in conjunction with the "K" controller, and those interested will be enabled to investigate the merits of the combination. The principle of the magnetic blowout device will also be shown and explained and its action demonstrated. This principle is embodied in all other devices in which electric arcs may occur, such as switches, fuses, lightning arresters, etc.

Several sizes of generator and feeder panels for station switchboards, all of black marbleized slate, with the necessary instrument mounted thereon, will also be shown. These panel boards are made in various capacities to suit the requirements of the plant, and have been devised so that the switchboards may be increased in size as the station grows, merely by the addition of other panels.

The line material exhibited will embody several improvements of an important character, which have become necessary by the increased demands of railroad service. The Thomson recording wattmeter in its portable form for testing on moving cars will also form an important item of the exhibit, which will be illuminated by means of Thomson '93 arc lamps for railway circuits, connected in series and operating on the railway lines. They have been especially designed for use in power houses, car barns and elsewhere, where light is desired from 500 volt circuits.

The exhibit will also comprise samples of underground feeder tubing, with models of junction boxes and taps, and among the literature which will be distributed will be found a special pamphlet dealing with the application of the three wire system to street railway work.

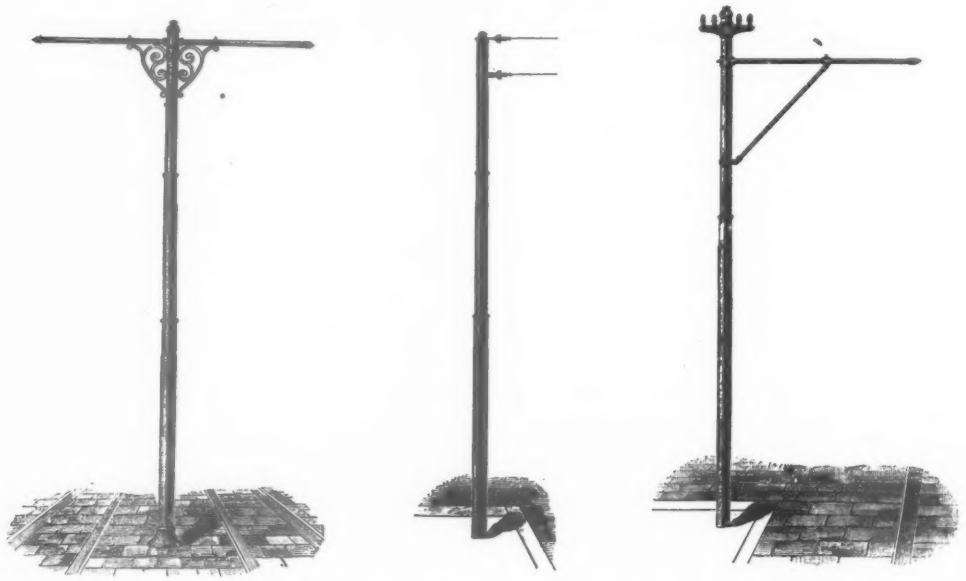
The interests of the General Electric Company will be in charge of Mr. W. J. Clark, general manager of the railway department. He will be ably assisted by Messrs. W. H. Knight, chief engineer of the railway department, Theo. P. Bailey, H. H. Corson, H. J. Crowley, W. B. Potter, H. C. Wirt and A. K. Baylor. Visitors to the convention will find a warm welcome at the Atlanta office of the company, and, indeed, anywhere where the General Electric Company's representatives may be found.

Stirling Boiler Sales.

The Stirling Boiler Company are justly congratulating themselves over the award to them of one of the largest boiler contracts ever placed. It is from the West Chicago Street Railway Company and calls for a plant of 8,000 horse-power. This contract was secured by the Stirling company in the face of the hottest kind of competition, every boiler company of prominence in the country being after it, and they naturally feel very well satisfied with the result. It should also carry encouragement to the trade at large as showing another evidence of the revival of business, and the possibilities which the electrical field afford. The Boston office, under the management of Mr. J. Bradford Sargent, is also making a good showing. Among the recent sales from this office is a 600 horse-power boiler to the Morgan Construction Company, of Worcester, Mass., for use in the plant of the Union Iron and Steel Company at Youngstown, O.

Morris, Tasker & Company's Wrought Iron Electric Railway Poles.

Morris, Tasker & Company, incorporated, of Philadelphia, were the first pipe manufacturers in this country and have been established since the year 1821. They have always occupied a position in the first ranks and have always been a power in the trade. During the last few years, in addition to their wrought iron pipe, boiler tube and fittings business, they have made a specialty of wrought iron and steel pipe poles. They got up a special S. S. S. joint pole, which proved to be the strongest pole manufactured in this country, and it was immediately adopted by the leading electric railway companies, so that for the last two years they have been supplying all the poles to companies such as the Philadelphia Traction, Electric Traction, Baltimore Traction, Consolidated Traction, the three leading Chicago companies, Hartford Street Railway and 50 other roads. They have never had a pole returned and are receiving the highest recommendations from all the companies that have used their make of poles. Morris, Tasker & Company will be represented at the Atlanta Street Railway Convention by Mr. Charles Yerkes Flanders.



Types of Wrought Iron Pipe Electric Railway Poles Made by Morris, Tasker & Company, Incorporated, Philadelphia.

STANDARD RAIL-BONDING SYSTEM.

BY THE ENGINEERS OF THE COLUMBUS CENTRAL RAILWAY COMPANY, OF COLUMBUS, OHIO.

In electric railway practice the connecting or "bonding" of the rails is becoming daily of more and more importance. Engineers of roads under construction and superintendents of roads already constructed now generally insist upon a well bonded track, and no longer look askance at the cost. Much thought has been expended and many devices have been brought out more or less meritorious, but there is still room for further progress, as we hope to show.

The idea long ago became fixed in the minds of most of the engineers and superintendents that rail-bonds must willy-nilly be attached to the *web* of the rail. No reason really exists for this practice, but the precedent was established and the bulk of to-day's work is done on that supposition. The practice is bad, because it is not taking advantage of the simplest law we have, that the resistance of a conductor varies directly as its length. In the common form of rail joint, the splice bars or fish plates are from 18 to 26 inches long, the latter now predominating. To bond from rail to rail through the web requires a rail bond 30 inches long, and the wire is usually about 36 inches long before bending and shaping.

FIG. 1.—BONDING "SHANGHAI" 60 POUND T RAIL.

But there is no need of this great length, since in all the usual form of joints it is quite feasible to apply very short bonds and thus in proportion reduce the resistance, which is the great objective point. The length from rail to rail can thus be reduced to a few inches, but we find in practice a bond *spanning* about eight or eight and one-half inches is about the best. Such a bond is about four-tenths the length of a bond spanning 30 inches, and, of course, only four-tenths the resistance. Now, two of the short bonds can be bought for the same price as one long bond, and if both are applied to the joint, the connecting resistance is reducible to two-tenths; in other words, for the same cost of material it is quite practicable to have five times as good a rail bond system as is obtainable with the usual 30 inch bond.

FIG. 3.—SHOWING STAGGERED NOTCHES IN SUPPORTING RAIL.

The illustrations herewith show how it is possible to meet most of the average conditions, and represent the rail-bonding system on the Columbus Central Railway Company's lines in Columbus, Ohio. Fig. 1 is from a photograph of a "Shanghai" 60 pound T rail, with flat splice bars 26 inches long. This rail has a wide base and there is plenty of room for bonding thereon. It is bonded with *two* 0000 copper "one-piece" rail-bonds. The bond holes are countersunk, and the rivets set up with a concave tool or "snap," which gives a heavy button head to the rivet end, as in boiler work.

Fig. 2 shows a 56 pound T rail with 26 inch angle bar splices. This has been a puzzler generally, but the solution is very simple. The horizontal portion of the angle bar has two seven-eighth inch holes punched as near as possible to the face of the vertical portion. These holes admit the "snap" tool readily, and the result is a very perfect connection. To avoid undue weakening by the clearance holes, we have them punched one nearer the center of length of the bar than the other, and always the same way, so when the joint is made up the opposite rail bonds are "staggered," as can be seen. In a channel bar splice the lower edge is nipped out in a punching press in a similar manner.

We are using "bridge joints" here in addition to the ordinary splices. These have been considered a vital obstacle to bonding through the rail base, but the thing is simple after all. We get the manufacturers to notch the edges of the supporting rail as in the above cases. The notches are again staggered, as in Fig. 3, and the trick is done.

All these special punchings or notchings are done at the mill and, if ordered when the rails, bars or bridges are contracted for, cost nothing extra.

We drill all holes for the rivets right on the spot, being thus assured they are right and all surfaces fresh and bright. We use nothing but 0000 copper bonds, even on the deep groove guard rail of "special work." In this, at the corner of the groove, we drill a half-inch hole through downwardly at an angle of about 30 degrees from vertical, then follow with a seven-eighth inch drill far enough to accommodate the button-head without exposure. The short rail-bond is then inserted from below and headed up with the "snap." Two bonds per joint are used in this case also, each being curved along its length so as to overlap the other laterally.

The average cost for all this drilling and bonding, including all labor and wear and tear of tools, etc., is about four cents per hole made. As we use double bonds, we average about 740 holes per mile of single track, or a total cost of, say, $30 per mile of track. These figures are the average of many thousand holes and are reliable.

Comparing then our road here with any other which is bonded with one long No. 0000 copper bond at each joint, we can lay claim to a bond system about five times as good at an extra cost over such other road of but $15 per mile of track.

BARRY & MCTIGHE,
Engineers.

Columbus, October 2, 1894.

FIG. 2.—BONDING 56 POUND T RAIL.

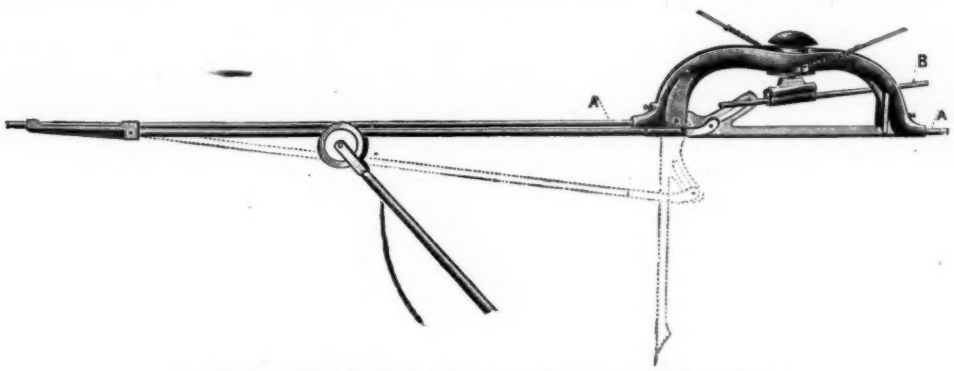
OBITUARY.

The many friends of Mr. Thomas B. Kerr, of Kerr & Curtis, the well-known lawyers of 120 Broadway, New York, will sympathize with him in the loss of his eldest daughter. Miss Kerr met her death as the result of the severe storm of last Wednesday. She was asleep in bed at her home in Englewood, N. J., when the chimney on the house was blown over. The chimney crashed through the roof and fell right across Miss Kerr's bed, causing such injuries that she died within a short time. The ELECTRICAL REVIEW extends its profound sympathy to Mr. Kerr and his family in their bereavement.

FLETCHER'S RAPID TRANSIT SWITCH.

AN INGENIOUS DEVICE FOR OVERHEAD TROLLEY LINES.

The Fletcher Manufacturing Company, of Dayton, O., is placing on the market one of Mr. John R. Fletcher's ingenious inventions, known as a rapid transit switch for overhead trolley lines. It is designed to provide means whereby two trolley lines crossing at right angles, or running almost parallel to each other, may be freely used by two roads having separate electric currents without interference in any way, and without slowing up the speed of the car or pulling down the trolley pole of the car on either road. This switch has been tested with cars running up to 30 miles an hour, and in every case the trolley passed the switch without shock or interference with the current.



FLETCHER'S RAPID TRANSIT SWITCH FOR OVERHEAD TROLLEY LINES.

Referring to the illustration on this page, the letters "A" "A" show the trolley line of which the Fletcher rapid transit switch forms a part, and the letter "B" a trolley line crossing the line "A" "A," being suspended underneath the arch in an insulated clamp. The illustration represents the switch with the gate closed ready for the trolley wheel to pass over. The dotted lines show the position resumed by the latch and rod after the trolley wheel has passed over the switch, leaving the line "B" ready for use when required.

Attached to the line "A" "A" is a shoe, shown on the extreme left. To this shoe is pivoted a steel rod, which operates the latch, closing the space beneath the arch. When the trolley wheel runs along line "A" "A" the shoe guides it off the trolley line on to the steel rod. Before the trolley wheel has traversed half the length of the rod, the latch has been operated, closing the opening of the arch and making a continuous path for the wheel. After the wheel has passed the arch the latch and rod fall back into their normal position shown in the dotted lines. This leaves the trolley line "B" free, ample space in the opening of the arch being allowed for the easy passage of a trolley wheel.

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Instead of from "Atlanta to the Sea," this week it is from everywhere to Atlanta.

Our successful monthly contemporary, the *Street Railway Journal*, celebrates its tenth anniversary this week. Our congratulations, President McGraw.

To the practical electric railway man, from president to motorman, this issue of the ELECTRICAL REVIEW is of the highest value. It is full of meat—the right kind, too.

Col. W. L. Strong, nominated for Mayor of New York, was for many years president of the Brush-Swan Electric Company of New England, and has a host of admirers in electrical circles. He will make an ideal Mayor of this great city.

The cordial words of welcome from Governor Northen and Editor Clark Howell, published in the ELECTRICAL REVIEW this week, will be greatly appreciated by the hosts of traction advocates who visit Atlanta this week. They bespeak the proverbial Southern hospitality.

SOCIAL FEATURES AT THE ATLANTA CONVENTION.

A reception to the visiting delegates and all ladies attending the convention will be given at the Capital City Club, of Atlanta, on Wednesday evening, October 17, from 4 to 9 o'clock. A number of Atlanta ladies will receive.

The ladies attending the convention will be invited to a carriage ride on Thursday morning, October 18, during which the most beautiful and interesting localities in Atlanta will be visited. The annual banquet will take place Thursday evening at 9 o'clock.

An old-fashioned Georgia barbecue will be provided on Friday at Stone Mountain, 20 miles from the city.

ELECTRIC RAILWAY DEVELOPMENT.

Judging from the mass of news from the electrical field which has been coming into the ELECTRICAL REVIEW office for the past three months there is more electric railway construction in sight for the Spring of 1895 than has been apparent in any two previous years. One electric railway contractor tells us that he has $1,500,000 worth of work already signed for on which he is to begin construction as soon as the frost is out of the ground. This is encouraging and means more than appears on the surface. The public demands rapid transit, and as the overhead trolley system is the best medium in sight for providing it, capitalists are showing their faith as indicated above.

A FEW CONVENTION SUGGESTIONS.

An open discussion of the question of lighting the trolley cars might bring out much information on this debatable matter.

We hope the question of track circuit will have a thorough ventilating. Nothing in the whole range of an electric railway equipment is of more importance than the little detail of connecting rail to rail. The tendency to heavier connection is growing rapidly not only in new construction, but in existing railways, where much overhauling has been done of late. We believe in going to extremes, almost, in rail bonding. The difference in cost per mile between deficient and thoroughly good rail connections is so small that there can be no excuse for the saving.

We would like some delegate familiar with the subject to give facts about roller bearings on electric trucks. We hear them highly praised in the few places where they have been put to practical every-day work, and the results, if properly announced, will be likely to surprise even the really progressive management. We predict that in the near future the majority of the electric cars will be provided with roller bearings. When that time comes the power station equipment will in small and moderate sized roads bear a better proportioning to the number of cars than is now possible. There is room for a great deal of intelligent work in this direction.

ELECTRICAL EDUCATION.

We believe the National School of Electricity to be founded on correct principles and its objects worthy and practical. The 200 earnest young men—and some not so young—who assembled at the first meeting at Hardman Hall, in this city, last week, gave ample proof of the demand for an institution of this kind. The ELECTRICAL REVIEW believes that the efforts of the present energetic management and most excellent faculty will be crowned with most satisfactory success.

YES, JOSEPH; A VERY LONG WAY AHEAD.

The ELECTRICAL REVIEW, the highest authority in such matters, informs us that a telephone company now rises in the magneto field and proposes to furnish service in New York at $2 a month, adding: "It has fun ahead."

Better than that; it has a fortune ahead.—*Joseph Howard, New York Recorder.*

STORAGE BATTERY DECISION.

A LETTER FROM PRESIDENT GIBBS.

Judge Lacombe, of the United States Circuit Court, on October 10, denied the motion of the Edison Electric Illuminating Company, of New York, to suspend, pending appeal, the injunction granted by him on October 8 last against the use of the chloride battery. The ELECTRICAL REVIEW has received the following letter commenting on this decision:

OFFICE OF THE ELECTRIC STORAGE BATTERY COMPANY,
842 DREXEL BUILDING.

TO THE EDITOR OF ELECTRICAL REVIEW:

In view of the publicity given to Judge Lacombe's recent decision in the case of The Accumulator Company *vs.* The Edison Electric Illuminating Company, of New York city, directed against our chloride accumulator and based upon the Swan Re-issued Letters Patent, which expires May 24, 1895, we deem a statement of facts necessary that our customers and the public generally may not be deceived or tricked into withholding orders from us through fear of litigation, or into buying the inferior batteries of The Accumulator company and the Consolidated Electric Storage Company in the belief that they cannot procure and use with perfect safety our chloride accumulators, which we are manufacturing and selling under an absolute guaranty to protect and save harmless all users.

This company has not been enjoined from either manufacturing, selling or using its well-known chloride accumulators, nor has anyone been enjoined from purchasing or using them. The Edison Electric Illuminating Company, of New York, has been enjoined by Judge Lacombe from installing our chloride accumulators as a part of its central station plant simply to maintain the *Statuo quo* pending the hearing and determination of the case in the Circuit Court of Appeals, upon the contention that the Edison Electric Illuminating Company, having simply contracted for our accumulators and not yet actually installed them, should not be permitted to do so until the questions involved in the litigation should be finally determined in the United States Circuit Court of Appeals, especially as an appeal could be at once taken to and heard in that court on the 30th of October and an early decision had thereon; and that was the view taken by Judge Lacombe and upon which he acted.

Judge Lacombe's injunction has no other effect or significance, and in no way affects this company's business of manufacturing and selling chloride accumulators, or of their use by purchasers, and was conditioned upon the Accumulator Company giving to the Edison Electric Illuminating Company, of New York, a bond in the sum of $20,000 to make good any loss which it should sustain resulting from the delay in installing our accumulators should the decision of the Circuit Court of Appeals be in favor of the Edison company, which we are advised and believe will be the certain result of our appeal to that effect.

We are advised by our counsel and experts, among them Professor Charles F. Chandler, of the School of Mines, Columbia College; Professor George F. Barker, of the University of Pennsylvania; Professor Edwin J. Houston, President of the American Institute of Electrical Engineers, and Professor Arthur E. Kennelly, of the Medico-Chirurgical College of Philadelphia, that our chloride accumulator is not an infringement of any letters patent owned by either the Accumulator company or the Consolidated Electric Storage Company, and that in their opinion the Swan Re-issued Letters Patent are invalid and expired with the expiration of the Swan Danish patent in 1888; defenses which could not be availed of by us in opposition to the motion for preliminary injunction before Judge Lacombe, they having been previously passed upon by Judge Coxe in a former decision in the same court in the case of the Accumulator company vs. The New York and Harlem Railroad Company for the use of the so-called Julien Battery, which battery was made in exact accordance with the plate of the Swan Re-issued Letters Patent, and in which our chloride battery was not involved. Judge Lacombe held that on a motion for a preliminary injunction Judge Coxe's opinion was controlling and must prevail until the consideration of the case in the Circuit Court of Appeals, when those defenses would be fully heard and determined for the first time, as in the case wherein Judge Coxe sustained the Swan Re-issued Letters Patent no appeal was taken, an agreement having been made between the Consolidated Electric Storage Company, who was defending that case, and the Accumulator company shortly after that decision.

The facts are these, from which any intelligent reader can draw his own conclusion:

In December, 1890, this Accumulator company brought suit against us in the United States Circuit Court for the district of New Jersey, in which we appeared and made answer, and thereafter, and down to the Fall of 1893, no attempt was made to press the case, when it was finally abandoned, owing to our positively declining to further extend the time and demanding that the case proceed to trial. The Swan Re-issued Letters Patent, upon which alone Judge Lacombe's injunction is based, was at that time owned by the Accumulator company, although they did not include it in that suit nor did they, after abandoning the suit, make any claim against our plate until August last, when the Edison Electric Illuminating Company, of New York, selected our battery for central station use in preference to any other battery in the world. Then, instead of bringing suit against us they brought suit in New York against the Edison Electric Illuminating Company, and applied for an injunction to force a temporary delay in the installation of the battery under our contract with that company. The work of preparing for the installation is going on and will be completed in time to install the battery upon the decision of the Circuit Court of Appeals, which we are confident will be favorable to us, and may be expected early in November. Swan's United States patent was applied for January 18, 1882, and was based upon an English patent to Swan of May 24, 1881, which expires May 24, 1895, at which time the United States Letters Patent will also expire, so this much talked of suit is based upon a patent which will expire in about seven months, and obviously was brought for no other purpose than annoyance.

There is no occasion for anyone to be annoyed or intimidated by threats of litigation from the makers of these inferior and condemned batteries, for we shall continue to manufacture the chloride accumulators and furnish them under an absolute guaranty to all who require the best battery for all purposes now manufactured, and when the Accumulator company wants to enjoin us, they will have no difficulty in finding us, no more so than did the Consolidated Electric Storage Company, who brought a suit against this company in January last in the United States Circuit Court for the District of New Jersey, accompanied with a motion for injunction, which, after full preparation, was heard at great length before Judge Green, and resulted in an opinion denying the motion for injunction—which opinion speaks for itself, having heretofore been published in the columns of this journal. Since then that suit has been dismissed.

We are ready at all times to fight out any supposed charge of infringement that either the Accumulator company or the Consolidated Electric Storage Company think they have against us, but we object to their proceeding against our customers, which, obviously, is for the sole purpose of annoyance and intimidation—methods which reputable business men would not countenance. Let them proceed directly against us, when, if they get an injunction, it will be of some value to them and the public will not be annoyed. All suits which they have heretofore brought against this company have been abandoned.

We say to our customers, and those contemplating the purchase of storage batteries, not to be intimidated or influenced by any threats of litigation, or any such public announcements as have been made, based upon the above explained decision of Judge Lacombe, as this company will stand between its customers and these attacks.

ELECTRIC STORAGE BATTERY CO.
By W. W. GIBBS, *Prest.*
Philadelphia, Pa., Oct. 13, 1894.

THE ACCUMULATOR COMPANY WINS.

Judge Lacombe, of New York, rendered the following decision last week in favor of the plaintiff in the case of The Accumulator Company *vs.* The Edison Electric Illuminating Company, et al.:

United States Circuit Court, Southern District of New York.

The Accumulator Company
vs.
The Edison Electric Illuminating Company, of New York, impleaded with the Electric Storage Battery Company.

Lacombe, Circuit Judge.

The Battery company, which is named as a defendant, but which, being a non-resident has not been served, and does not appear, manufactures the articles alleged to infringe. The Illuminating company has contracted to purchase a large number of them and is about to put them to use in this city. Complainant is the owner of Letters Patent Re-issue No. 11,047, December 17, 1889, original No. 312,599, February 17, 1885, to J. W. Swan for "Secondary Battery," a variety of electric storage battery. The original patent No. 312,599 was considered by this court in Accumulator Company vs. Julien Company, 38 Fed. Rep., 117 and held invalid, as it described and claimed more than the inventor discovered. Thereupon re-issue was obtained and such re-issue was considered by this court and sustained in Accumulator Company vs. New York and Harlem Railroad Company, 50 Fed. Rep. 81, opinion by Judge Coxe. In an application, therefore, for preliminary injunction on the same patent the construction laid down in that opinion will be adhered to.

The claim of the patent is for "A perforated or cellular plate for secondary batteries, having the perforations or cells extending through the plate, and the active material or material to become active packed in the said perforations or cells only, substantially as described."

Judge Coxe held that although the art already showed plates in which the active material was packed into grooves or holes not extending through the plate, and also plates where the active material filled not only the perforations but also the entire surface of the plate itself, Swan's combination in which the perforations extended through the plate and the material filled the perforations only was original with him. That it was not only new but useful, an important advance in the art, and that "the idea which has made these plates a commercial success was first given to the world in a practical embodiment by Mr. Swan." No new evidence tending to modify Judge Coxe's opinion being introduced it settles the law of this case, and the only question here is whether defendant's plates infringe.

These plates, which are for secondary batteries, are perforated plates; the perforations extend through the plate; the active material is found in the said perforations, and in them only. Infringement by the completed structure is so plain that defendant has been constrained to insist that Swan's patent is practically for a process; and, therefore, as defendant's process of making the plates is a different one, there is no infringement. Thus, Swan constructed a plate with perforations or cells extending through it, and then packed the material in the perforations; defendants arrange pastilles or buttons of the material in a mould and then cast the plate around them. Manifestly the result is the same whether the material is packed within the bounding walls of the perforations, or whether the bounding walls of the perforations are packed around the material. Defendant also insists that the material which they use is not active when the process of packing antimonious lead around it is complete, and that it does not become active the moment it is placed in the battery fluid, but requires further electrolytic treatment before it becomes active. But the patent is not confined to active material; it includes "material to become active," and whether it becomes active by one process or another is apparently immaterial. The gist of Swan's invention as found by Judge Coxe was the confining of the material which was to do the work within perforations which extended completely through the plate. The advantages of such plates is pointed out in his opinion, and those which defendant threatens to use are plainly such plates. There is nothing in the patent or in Judge Coxe's opinion which supports the contention that the claim is other than what it appears to be—a claim for a completed article, not for a process of manufacture. Infringement is clear.

It is further contended on behalf of the defendant that complainant has been guilty of such laches as should preclude the granting of a preliminary injunction. In a case where this defendant or its allied corporation was complainant, the Court of Appeals in this circuit held that the owner of a patent was under no obligation to sue every infringer forthwith upon discovery of the infringement, provided he proceeded with due diligence against the one whom he did sue (Edison Electric Light Company *et al.* vs. Sawyer-Man Electric Company, 3 C. C. A., 605). There is no suggestion of any unreasonable delay in prosecuting the test suits against the Julien company and the New York and Harlem Railroad Company. Judge Coxe's decree in the last-named suit is dated April 12, 1892. The present action was begun in August, 1894. During the intermediate period and for some years before, certainly since 1889, the Storage Battery Company made plates which differed from those sold to the Illuminating company, both in the size of the plate and in the size of the buttons. The plate now complained is 15 inches square and contains 256 buttons of active material. The older plates were six by eight inches, and contained nine or twelve buttons. Both were equally infringements of the patent, which is not confined to plates or buttons of any particular, absolute or relative size. Complainant insists that it did not prosecute for infringement by the earlier plates, for the reason that it did not believe them to be commercially harmful. The grounds for that belief are said to be the relative size of plate and button. In the latter plates, the loss by accident while in use, of the contents of a single hole would not, it is asserted, practically destroy the usefulness of the plate, being only a loss of $\frac{1}{12}$ of the active material. A similar accident to the older plate, however, would destroy its usefulness, as the single perforation holds one-ninth or one-twelfth of the active material. This explanation seems a reasonable excuse for failing to prosecute against the older plates, and I find nothing in the transactions between the complainant's officers and those of the storage battery which should estop complainant from maintaining this action. In April, 1893, certainly both sides understood, and expressed their understanding in writing, that the question of infringement of the several patents owned by complainant would be tested by suit.

As to the Danish patent, the conclusion reached by Judge Coxe, without argument, viz., that "it is not for the same invention as the Swan re-issue," is concurred in by this court, after argument.

Motion for preliminary injunction granted.

Endorsed: Circuit Court of the United States, for the Southern District of New York. The Accumulator Company *vs.* The Edison Electric Illuminating Company, of New York, impleaded with the Electric Storage Battery Company. Opinion. Lacombe C. J. United States Circuit Court, filed October 8, 1894. John A. Shields, Clerk.

American Institute of Electrical Engineers.

The ninetieth meeting of the Institute will be held at headquarters, 12 West Thirty-first street, New York city, on Wednesday, October 17, at 8 P. M. A paper will be presented by Lieut. Samuel Reber, of Fort Riley, Kan., recently of Johns Hopkins University, Baltimore, on the "Theory of Two and Three Phase Motors." Also a paper by Mr. Charles P. Steinmetz, of the General Electric Company, Schenectady, N. Y., on the "Theory of the Synchronous Motor." A meeting of Western members will be held on the same evening, October 17, 8 P. M., at Armour Institute, Thirty-third street and Armour avenue, Chicago, where the above papers will be read by Prof. W. M. Stine.

De Ronde-Bennett.

Mr. Frank S. De Ronde, of the Standard Paint Company, New York, and Miss Kate Weaver Bennett were married at Teaneck — Englewood, N. J., on October 11. The ELECTRICAL REVIEW extends its congratulations.

New York Electrical Society.

The members of the society on last Thursday afternoon inspected the electro-disinfecting plant at Riker's Island, N. Y.

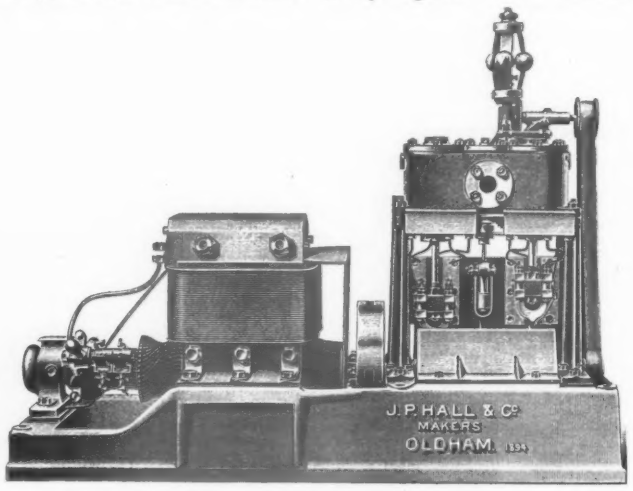
An English Combined Engine and Dynamo.

The combined engine and dynamo illustrated herewith is thus described in the London *Electrical Review:*

The engine has a high pressure double cylinder to give 7½ indicated horse-power, with 80 pounds steam pressure at 500 revolutions per minute. The over all dimensions of the engine and dynamo are 1 foot 9 inches by 4 feet 10 inches by 3 feet 10 inches in height. The dynamo gives 40 amperes at 100 volts, at 500 revolutions per minute, the magnets being shunt wound. The engine bed is of box section, with extension for carrying the dynamo. The crank pedestals are cast on and fitted with bronze bearings. The stuffing boxes are long, and the glands screwed on, this form being adopted so that they shall not bind on the rods through carelessness in screwing up unevenly.

The cylinders are 4½ inches in diameter by 3 inches stroke, lagged with planished sheet steel over non-conducting felt. The standards are of cast-iron, of H section, and the pistons are of aluminum steel, fitted with hard cast-iron rings and secured to the rods with cones, collars and metal nuts. The piston rods and the crank shaft are of steel of large diameter and great strength, working in long bronze bearings. The bearing at the armature end is made extra long, and the shaft is provided with a coupling forged out of the solid, and on this the fly-wheel is keyed; this bearing is so arranged that it takes up any thrust or pull from the armature. The fly-wheel is made with slots for barring, which are so arranged that if the engine moves suddenly forward when the bar is in, it comes out automatically without risk or shock to the attendant. The connecting rods are of steel, of the ordinary marine type, and the lubrication is effected by tubes from the main oil box. The governor is of the Pickering high speed sensitive type, driven by a strap. The guides are of cast-iron, secured to the back of the standards. The slide blocks are of steel, are lined with Magnolia metal, and lubricated by tubes from the main oil box. The piston rods are secured by steel nuts, pinned in position on each side of the slide block.

The dynamo, as above-mentioned, is shunt-wound, and has a drum armature. The magnets are of soft charcoal iron, of the single horseshoe type—cores and pole pieces in one—machined all over. The yoke is formed of a separate piece, fitting between the extended top ends of the cores and secured in position by bolts. The shunt coils are carried on sheet-iron formers with brass ends, the coils being of high resistance, held in position with the brass end rings. The angle plates for carrying magnets are massive brass castings. The armature core is built up of annealed charcoal iron disks, insulated from each other, and mounted on a strong steel shaft fitted with key to drive the disks. The winding consists of a sufficient number of turns of insulated copper wire of such sectional area as to give the specified output. The insulation is mica and tape throughout and coated with varnish. The driving power is transmitted to the winding by means of a number of flat driving teeth let into the core and insulated with mica. The commutator is of large diameter, with 40 bars of hard-drawn copper, insulated with mica, and carried on a cast-steel bush keyed on the shaft. The depth of the bars in the direction of wear is three-quarter inch. The collecting gear consists of four brushes, two for the positive and two for the negative, held in holders with holding-off catches. The shaft is hard steel, the keys being sunk in, and with half coupling forged out of the solid to couple to the engine crank shaft.



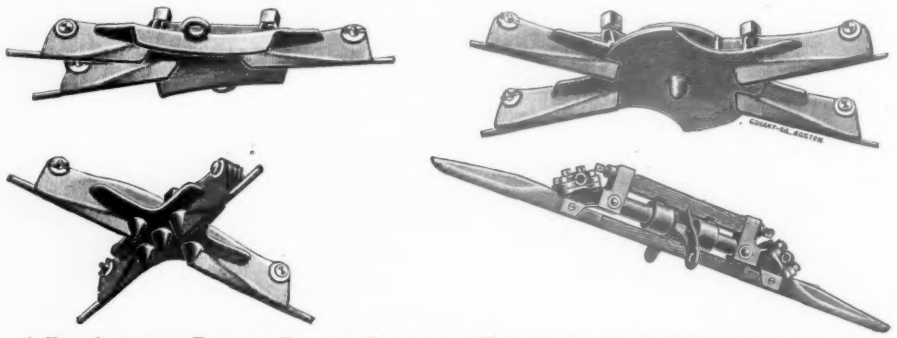
An English Combined Engine and Dynamo.

The Common Council of Boston has appointed a committee to consider the subject of compensation for the use of highways by the street railways, electric light, gas light, telephone and telegraph companies. Boston's a slow place, anyway. Baltimore street railways have been paying the city nine per cent of their gross receipts for years, and it costs telephone, telegraph and electric companies $2 per pole in the city.—*Baltimore World.*

New Trolley Line Devices Made by Albert and J. M. Anderson.

Albert and J. M. Anderson, 289 to 293 A street, Boston, Mass., are, as usual, keeping fully abreast of the times and have produced some new devices for trolley line construction, several of which are illustrated herewith. Among them are new types of straight under-running trolley frogs and crossings and section insulators. Every engineer who is familiar with the construction and operation of the trolley system knows how much a practical, straight, under-running frog and crossing is needed, to avoid the dipping and consequent sparking of the trolley wheel in passing under them, as well as a well-known tendency to jump the wire at these places.

It is an easy matter to make a frog that is straight, under-running before it is subjected to the strain of the trolley wire, but by a careful investigation of the needs in this direction and a number of experiments, Albert and J. M. Anderson have devised a construction that is strong, will not buckle under the line tension, but will remain flush under-running. It is not heavy and clumsy, and is so constructed that no soldering is necessary. A prominent engineer of one of the largest electric railroads has remarked, concerning these frogs and crossings, that they are the greatest improvement in trolley line fixtures that he has noted for some time. The new section insulator (also flush under-running) is made for permanent construction.



A Few Overhead Electric Railway Specialties Made by Albert & J. M. Anderson, Boston.

The Lambertville, Pa., Electric Light, Heat and Power Company has been sold by the receiver to D. Stuart Robinson, of Philadelphia, for $10,-050, clear of encumbrance. The plant cost $33,500.

To Study Electricity.

The National School of Electricity has just established headquarters in New York city at the Decker building, Union Square.

Classes will be organized at several points in the city, as well as in Brooklyn and surrounding towns. Another office has been opened in Philadelphia in the Drexel building, and within a few days a Boston office will be opened.

From the Western office at Chicago classes have been organized in seven Western and Middle States, aggregating in membership something over 1,500 students. Some of the classes have been in operation since June and have already covered one-third of the course, which has a complement of 45 lessons.

The course of study is arranged so that the first 15 lessons are confined to demonstrations in the study of the fundamental laws of the science, and the balance of the course is given to the applications of those laws in the construction and operation of commercial and scientific apparatus.

The method of preparation of the lessons is thorough. Each lesson is first prepared by a member of the faculty, then edited by a duly selected editor, also a member of the faculty, with a view to making the course harmonious as a whole. After being written and edited, each lesson is submitted to the several members of the faculty for criticism, and finally revised by the original writer in the light of the criticisms and suggestions of his co-laborers. The writer also submits with each lesson a schedule of apparatus required for its demonstration and specific directions for the guidance of instructors.

Two special courses are already provided, in addition to the general course, one for railway men, and an electro-therapeutic course for doctors. Professor Shepardson, of the University of Minnesota, a member of the faculty of the school, has special direction of the railway course, and Dr. W. J. Herdman, professor of diseases of the nervous system and electro-therapeutics in Ann Arbor University, also a member of the faculty, has personal direction of the electro-therapeutic course. Dr. Herdman is now preparing to surround himself with a special faculty of advanced workers in this branch of the science to colaborate with him. Already there are three classes of doctors in Chicago and within a week or two others will be formed in New York.

In these special courses, the work of the general course is carried through the physics of electricity, and from that point the special applications of the current are taught. In the medical course it is contemplated to have the ablest surgeons teach the surgical applications of the current, the best available talent on that subject teach the applications of electricity in diagnosis, and so of nervous diseases, etc.

Most of the classes of the general course meet one evening each week, but some of them meet two or three

evenings. Several of the classes are made up exclusively of stationary engineers and some exclusively of electrical workers.

A feature of the school is the free admission of students of special talent who cannot pay even the small tuition fee charged.

No pretension is made by the school management that the institution will fit its students, without further preparation, for expert positions. It is candidly admitted that the function of the school is to prepare students in the fundamentals of the science so that they may prosecute their studies in the various text books intelligently, without the fear that these will "shoot over their heads" as it were. Nor is it claimed that the school is intended in substitution of college work, but is the best possible substitute for those who cannot, by reason of circumstances, avail themselves of college facilities.

In Chicago, where the school began its existence, the Board of Education of the public schools thought so well of the work after it had been in operation for a short time, that the Board, by official resolution, granted the management the free use of public school buildings in which to hold class meetings.

Street Railway for Conway.

Currier, Mayo & Company, of 8 Oliver street, Boston, have secured the contract for the complete steam equipment of a power house for the Conway Street Railway Co., of Conway, Mass. The contract calls for 125 horse-power McIntosh & Seymour engine and Bigelow boilers. The road will be used for freight and passenger service, and will run from Conway to Conway Station, a distance of about 10 miles. Five miles of the line will be completed by November 1 and the balance as soon as possible.

The Edison Electric Illuminating Company, of New York, has declared a dividend of 1½ per cent payable November 1.

Car Wheel Machine Tools Made by the Niles Tool Works.

The Niles Tool Works, of Hamilton, Ohio, are recognized as being the makers of standard machine tools for many purposes. Two of their machines used in the manufacture of the modern car wheel are illustrated herewith. In Fig. 1 is shown their 36 inch car wheel borer. This machine is modeled after the design of their large 42 inch car wheel boring machine, of which latter type they have hundreds in use throughout all the leading railroad shops in this country, which have given complete satisfaction in every particular.

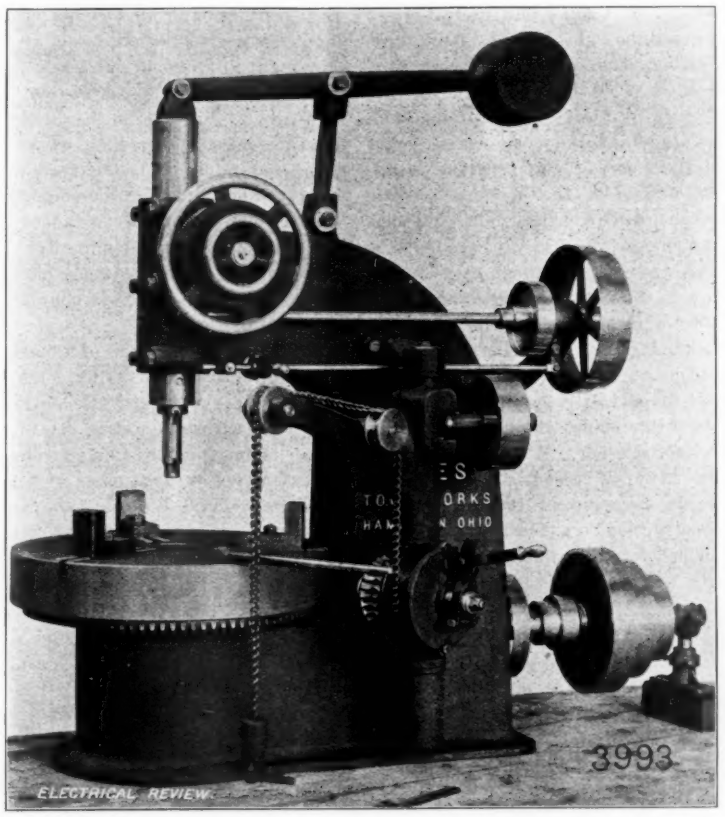


FIG. 1.—THE NILES TOOL WORKS' 36 INCH CAR WHEEL BORER.

The simplicity of design, ease of manipulation, convenience of clutch and operating levers, combining solidity and efficiency, all the above tending toward the one great aim—a labor-saving tool to get out product quickly—are the essential features of this machine. The diameter of the table is 41 inches; neat swing of the machine, 44 inches.

A three stepped driving cone, ranging in diameter from 12 to 20 inches for three and one-half inch belt, is provided.

The table spindle bearing is eight inches diameter, 14 inches long, with top bearing carried as close to under side of table as possible, and the table spindle is provided with a lower step bearing with friction washers.

Maximum distance from table to bottom of cutter bar when at its highest position, 16 inches. The table is driven by bevel gearing.

Three feeds, two roughing and one finishing, are provided. The change from roughing to finishing feed is obtained by means of a clutch operated from front of machine. Feed to boring bar is through the means of friction clutch, as on the 42 inch machine. Boring bar provided with quick hand traverse is six inches diameter and has cutter bar for two cutters, one for roughing and one for finishing. The column bearing for spindle is six inches diameter and 22 inches long.

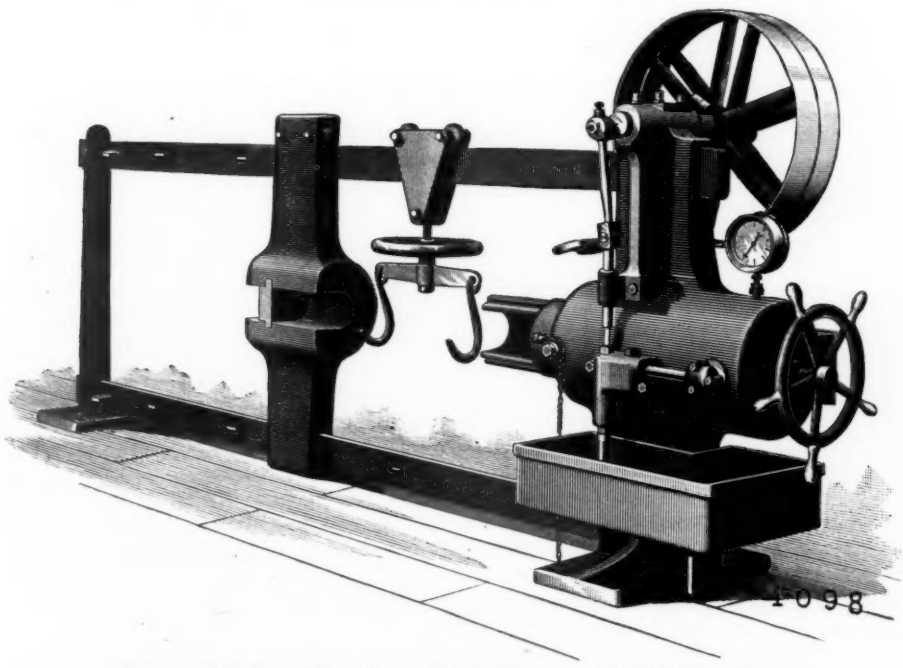


FIG. 2.—THE NILES TOOL WORKS' NO. 1 HYDROSTATIC CAR WHEEL PRESS.

In Fig. 2 is shown the Niles Tool Works' No. 1 hydrostatic car wheel press. This press will take in wheels up to 36 inches diameter and is tested up to a pressure of 100 tons before leaving the works. The cylinder is made of the best cold blast iron and lined with copper, the lining being well burnished in the cylinder. The ram is eight inches diameter and has 18 inch stroke. The pump has a single plunger, three-quarter inch diameter. Each machine is furnished with pressure gauge, lock-up safety valve, relief valve, returning weight, tank, etc. This machine is particularly adapted to pressing wheels on and off axles such as used for street railroad cars. It offers exceptional facilities for replacing worn wheels quickly, thereby keeping the car out of service the minimum of time.

PERSONAL.

Mr. J. Potter, president of the Buckeye Electric Company, of Cleveland, Ohio, was in New York last week.

Mr. C. A. Bragg, manager of the Westinghouse Electric and Manufacturing Company's Philadelphia office, was among the visitors to New York last week.

Interesting experiments in lighting mills with arc lamps are being made in Pawtucket, R. I., at the Goff Braid Mill, by Mr. Darius L. Goff, who, while in Europe, was an interested observer of an English method of illuminating by inverted arc lamps.

Mr. W. S. Barstow, general superintendent of the Edison Electric Illuminating Company, of Brooklyn, N. Y., and Miss Frances W. Du Clos, of Highland Park, N. J., were married at New Brunswick, N. J., on October 4. The ELECTRICAL REVIEW extends it congratulations.

Mr. J. R. Bennett, formerly with the E. W. Bliss company, has recently become connected with the National Lead Company, of No. 1 Broadway. Mr. Bennett's enviable record with the first named company renders success assured in his new field of labor, and the REVIEW extends to him its well wishes for the future.

Mr. Stephen A. Douglas, formerly with the Edison General Electric Company and later manager of the Brush Electric Company's Chicago office, will have charge of the New York offices of the Fort Wayne Electric Corporation. Mr. Douglas is recognized as one of the best salesmen in the electrical field, and the Fort Wayne Electric Corporation is to be congratulated on securing his services.

Electrical Notes from Northern Ohio.

The week has been rather quiet in electrical matters about Northern Ohio. Wednesday night was election night at the Electric Club. Mr. Wason was re-elected president. Mr. B. M. Barr was unanimously elected vice-president. This club is worthy of no little respect and attention from the entire electrical world. There is not a book published about electricity in any form that is not in the club's library, and standing orders are out for any volume that is published hereafter. Of course, they take all the electrical periodicals. Pool and reading rooms complete their modest outfit. An exceptionally interesting paper on some phase of mechanical or electrical work can be heard at nearly every meeting and the most instructive arguments can be counted on. Swords are crossed frequently by the members, who are made up from the ablest men in our business. Case School, Adelbert College and the various prominent corporations here contribute ability of no mean order to this club.

Mr. Hamill, of the Brush Electric Company, will go to the Street Railway Convention at Atlanta.

Both railroads report an increase of traffic here. Our cross town (Willson avenue) line will soon have cars running.

Mr. W. E. Sharp, agent for the Atlas Engine Works, is doing excellent business throughout the State. Two-thirds of all engines sold here within 18 months have been sold by Mr. Sharp.

The Paragon Insulating Company will soon be heard from and when their paint is on the market the trade will find a most excellent product. They are not people to put an inferior article on the market.

E. P. Roberts & Company report engineering work brisk. They have been testing the insulating paint of the Paragon Insulating Company and are very much elated that the trade is going to have soon so good an article.

Mr. Caulkins has just put 20 arc lamps of the General Incandescent Arc Light Company's make into O. D. Myer's dry goods store. He has completed both the Burrough Bros. and Weddell House plants. They both run very well—Siemens-Halske machines and Atlas engines. Mr. Caulkins has just closed another large contract.

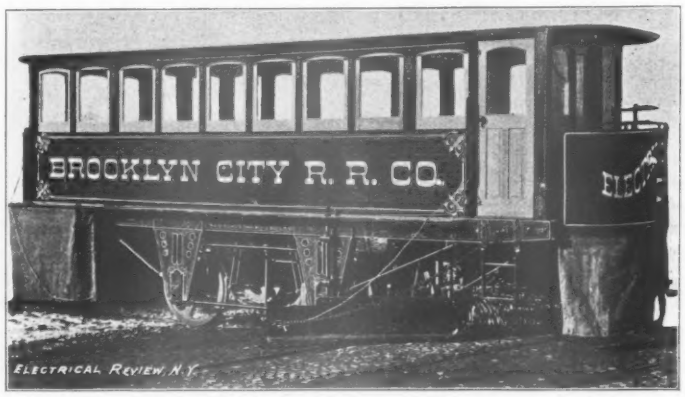
The light company has induced the Garfield block to take from their mains. The block has 2,600 lamps in it and makes a good customer. Of course, dynamo and engine men moan over the hard luck in not having an opportunity to put an isolated plant in the Garfield block. The new Chandler block will have 3,000 lamps and will furnish another skirmish between the light company and the several agents. H. L. B.

Cleveland, October 5.

The electric light plant at Fargo, N. D., is being rapidly enlarged.

Lewis & Fowler Manufacturing Company's Electric Snow Sweeper.

The subject of the accompanying cut of a modern sweeper, such as are manufactured by the Lewis & Fowler Manufacturing Company, of Brooklyn, N. Y., cannot but interest street railroad men at this time. Old, tried weather sharps predict plenty of weather with lots of snow for the coming Winter. Fortunately, such a state of affairs does not strike terror to the heart of the progressive railroad man for the modern electric sweeper dissipates the snow (the common enemy of every railroad man) as does the Spring sunshine, without any of the ill effects which are infallible signs of an early Spring. The Lewis & Fowler sweepers have met and conquered this enemy many times, and their large experience in this line of work enables them to turn out a perfect sweeper. A representative of the REVIEW recently saw at their works sweepers in several stages of construction; in fact, they were so pushed for space in this class of work that several sweepers just commenced were being finished in a vacant lot adjoining these works. The car industry generally, at this company's works, is enjoying a season of unusual activity, which is justly merited because of the reputation for good work, which is synonymous with the name of the Lewis & Fowler Manufacturing Company.



THE LEWIS & FOWLER MANUFACTURING COMPANY'S ELECTRIC SNOW SWEEPER.

A New Trolley Wheel.

The Robinson patent trolley wheel, manufactured and sold by the Wallace Electric Company, Chicago, is an excellent article and is meeting with great success. It has been subjected to some very severe tests and it has proven all that the manufacturers claim for it. The construction of the wheel is entirely new and novel, as it is made with an independent contact ring, which revolves independently of the flanges. The life of the contact ring is as long as that of the ordinary wheels and the cost for repairs is reduced to a minimum.

The Wallace company are manufacturers of electrical railway material and specialties, and carry a large and full line of all devices adapted for complete overhead equipments, and, although comparatively newcomers in Chicago, have already established a very gratifying business all over the West.

FINANCIAL ASPECTS OF THE ELECTRIC RAILWAY.

AN INTERESTING HISTORICAL RESUMÉ.

BY F. B. BAIN.

The street railway industry does not extend back more than a quarter of a century, and it was not until about five years ago that it was at all prominent in financial circles except through the medium of systems in large cities. Since 1888 the development has been phenomenal, owing to the introduction of electricity, which is everywhere replacing horse-power, and in many notable instances is becoming a strong competitor of steam lines in traffic between closely situated towns and thickly populated country territory.

There is still the lack of a market for street railway securities, such as the industry is intrinsically entitled to. This, without question, has hampered its development to a considerable extent. For a number of years back the General Electric Company, notably, and to some extent other supply companies, have assisted materially in financiering street railway enterprises. This has been unprofitable both to the railroads and, in the long run, to the manufacturers. The former have had to part with securities at a ruinously low rate, while the latter, owing to the load which they assumed, were forced in the end to liquidate at a sacrifice. This was the primary cause of the impairment of the General Electric's capital, to the extent of some $12,500,000, as was set forth in its last annual report.

For some little time a number of financiering companies have been in the field for the purpose of taking these securities and supplying funds for the purchase of equipment. To be sure they charge high commissions and stipulate that the business shall go to one particular company. However, they are necessary to construction in small places. Their usefulness can only be curtailed through a better understanding on the part of the capitalistic public of the street railway enterprise and its possibilities.

There is, perhaps, no security that is as stable and is as sure of its interest as one issued against a good street railway property. These enterprises are not affected by shortage in the corn crop, an over-abundance of wheat or a low price for cotton. Floods do not come and wash out their tracks, fires do not devastate the territory which pays tribute to them and pestilence does not reduce their traffic. As a rule they are not over-capitalized, thus necessitating a scraping of money each quarter or half year to pay their interest, and a constant financiering to keep some particular bond issue from being foreclosed. It is a simple proposition: "You put a nickel in the slot and take out a ride."

Perhaps the best substantiation of the foregoing statement are the fluctuations made by various street railway securities in the large cities during the panic, as compared with the prices of railroad and industrial stocks and bonds during that period. In July of last year the prices of the latter reached the lowest figure known in years. Some were selling so low that their interest yield ranged between 10 and 20 per cent. They have partially recovered since then, but the liquidation forced by the decline left a great many crippled financiers.

In marked contrast to this condition of affairs was the stability during all this period of street railway issues. As proof of this may be cited the bid and asked prices of the leading stocks and bonds of the two largest cities in the United States during July, 1893, and October, 1894. They show that the former prices approximate the latter. The record also shows that they make a similar comparison with prior months of 1893, all of which proves stability. The table follows:

CHICAGO.

	July, 1893.		October, 1894.	
STOCKS.	*Bid.*	*Asked.*	*Bid.*	*Asked.*
City	320	330	310	315
Passenger	100	..	100	..
North Chic. City	500	..	500	..
" " Street	196	197	246½	247
West " "	146	146⅛	131¾	132¾
BONDS.				
City 4½'s	94	94⅛	100⅛	101⅛
Passenger 6's	109	..	109½	..
North Chic. City 1st 6's	101	..	105	..
" " Street 5's	..	101	..	103⅛
West " " 5's	..	99	101⅞	102½
" " St. Tun. 5's	..	99	100	101½

NEW YORK.

	July, 1893.		October, 1894	
STOCKS.	*Bid.*	*Asked.*	*Bid.*	*Asked.*
Bleecker Street & Fulton Ferry	25	29	..	30
B'way. & Seventh Av.	180	184	185	188
Cen. P'k., N. & E. Riv.	52	..	154	160
Cent. Cross-town	150	165	154	160
Dry Dock, East Broadway & Battery	129	126	135	..
Forty-second & Grand Street Ferry	30	..	300	..
Forty-second St., Manhat. & St. Nich. Av.	70	72	49	52
Eighth Avenue	237	..	250	..
Houston, West Street & Pavonia Ferry	200	..	200	..
Second Avenue	137	137	134	135
Sixth Avenue	190	210	200	206
Third Avenue	120	126	186	188
Twenty-third Street	300	..	290	..
Ninth Avenue	125	129	140	..
Union Railway Co.	160	..	..	..

NEW YORK.

	July, 1893.		October, 1894.	
STOCKS.	*Bid.*	*Asked.*	*Bid.*	*Asked.*
Bleecker Street & Fulton Ferry 7's	110	111	110	111
Broadway & Seventh Avenue 5's	101	105	106	..
Broadway & Seventh Ave. 2d Mort. 5's	100	104	106	..
Broadway Guarantee 1st 5's	102½	104½	107	..
Broadway 2d Int. as Rent 5's	90	..	103	..
Central Park, North & East River 7's	115	..	111	..
Dry Dock, E. B'way & Battery 1st Mort. 5's	100	..	109	..
Dry Dock, Scrip (can be called at par) 6's	101	..	100	101
Forty-second St., Manhattan & St. Nicholas Avenue 1st Mort. 6's	110	112	110	112
Forty-second St. 2d Mort. inc. 6's	64	65	53	..
Eighth Ave. Scrip 6's	106	..	100	105
Houston, West St. & Pav. Ferry 1st 7's	103½	..	100	..
Second Avenue 1st Mortgage 5's	100	103	102	..
Third Avenue 5's	110½	113	117	..
Union R'lw'y Co. 5's	106	..	..	..
Central Cross town 1st Mortgage 6's	115	117	119	120

If managements of street railway

enterprises desire to put their properties before the investment public they should take more pains in publishing their earnings and detailed statements of operation. These, as a rule, are favorable, and would help the properties. There is nothing which will invite investment so completely as an exhausted statement, at stated intervals, of operations.

The Tackaberry Truck and Stephenson Car.

The illustration on this page shows a Stephenson car equipped with a Tackaberry truck and an enlarged view of the truck, both made by the John Stephenson Company, Limited, 47 East Twenty-seventh street, New York.

The Tackaberry truck is composed of two side sills of wood and reinforced with inserted metal plates. These are joined at the center by a wooden cross bar whose ends rest in the iron sockets, the whole securely fastened to the side sills. This wooden cross bar is not only the center brace of the entire truck frame, but always acts as the support to channel bars, which receive the nose of the motor frame, which thus rests easily upon a steel spiral spring. This method of construction with wood and iron in combination is not only elastic, but enables all the parts to be fitted and held securely, thus avoiding the loosening and rattling of bolts and nuts incident to iron trucks. The truck frame is supported by four dust tight journal boxes, thereby keeping journals and lubricator clean.

The wheel brake, supported on the ends of the side sills, is always held in unvarying relation to the wheels. The brake is simple and powerful, requiring minimum exertion of the motorman. By the combination of levers it is possible to apply the brake with force and rapidity, while at the same time it is not necessary to have such nice adjustment as is ordinarily required.

Special effort has been made to reduce the members of the truck to a minimum, and as a result all parts of it are readily accessible for the adjustment of motors, or for working at the under part of the car body. The truck is complete in itself, needing only when under the car body to have the brake chains attached to the hook of brake rod to make it ready for immediate service.

The four journal boxes which support the truck frames play vertically in the jaws of pedestals secured to the sills of the car body. These pedestals have at their ends receptacles for rubber ("Super") springs, with freedom of action in every direction, thus making flexible connection of the truck with the car body, without agitation or discomfort to passengers, and promoting the durability of the car structure and connections.

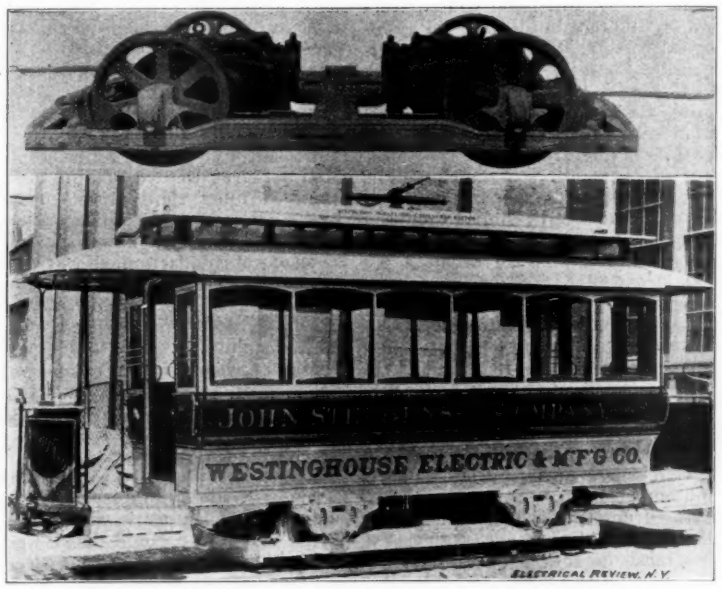
The John Stephenson company is rapidly delivering new cars for the Broadway cable road in New York city and also for electric roads in Brooklyn, N. Y., Allentown, Pa., Washington, D. C., Jacksonville, Fla., Bridgeport, Conn., Lorain, O., and for roads in San Salvador, Mexico and Cape Town, South Africa.

ELECTROLYSIS AND WATER PIPES.

ABSTRACT OF THE REPORT OF A SPECIAL COMMITTEE TO THE AMERICAN WATER WORKS ASSOCIATION.

At the recent meeting of the American Water Works Association at Minneapolis a special committee presented a report on electrolysis, of which the following abstract will be interesting to electric railway men:

In submitting what will have to be accepted as a report, the Committee on Electrolysis as affecting water mains wish to state that none of its members two months ago knew that they had been appointed to act thereon, and for that reason are less prepared to submit a more exhaustive report and one based rather upon personal investigation and study than upon that of others. The committee has had no opportunity to meet and the correspondence has of necessity been quite limited.



THE TACKABERRY TRUCK AND STEPHENSON CAR, MADE BY THE JOHN STEPHENSON COMPANY.

All reports agree with the views held heretofore, that the trouble is caused by the imperfect means provided by the electric street railway companies for the return of the current, and suggest sundry improvements upon the methods employed to return this current, from the double overhead trolley system, or the continuous perfectly insulated underground cable-return, to the various methods of bonding the rails and the use of an ordinary continuous return wire connected with the rails. Of these methods, undoubtedly the first two, while in perfect condition, would afford the most complete protection; but there are sufficient serious objections to them on the part of the street railway companies to prevent their being adopted, and the remedies, therefore, must be sought along the line of more reasonable requirements and against which the companies cannot sustain valid objections. By this statement it is not meant that it should be inferred that the electric railway companies should not be held to provide for positively adequate means of returning the current to the generator without damage to other property, but that if such object can be accomplished by other more moderate and suitable means, the companies who are deeply interested in the return of the current at as high a potential as possible will undoubtedly more readily provide the means of protection.

The rails, which in the first instance receive the return current, unquestionably possess, if the same were continuous without a joint, a sufficient conductivity to return all the current to the generator, excepting what in any case under the law of divided circuits is certain to escape to other conductors, if such exist. Therefore, all that is necessary to obtain the most perfect uninsulated and available conductor is to reduce all possible resistance at the rail ends by providing a most perfect bond between them, equal to the rail in conductivity, or, in other words, by riveting a copper bond of about 12 inches length to the rail ends, the section or number of these bonds to increase as the power house is being approached, supplemented by similar cross bonds connecting the four rails to each other every 100 to 120 feet.

These rail bonds should in section or number anticipate increase in traffic and extensions.

If a number of railway lines are operated from one power house, and particularly if the same is not on the line of the railway, ample return feeders should radiate out to the various centers so as to relieve the overloaded rails, and these return feeders should be well insulated to preserve them and also to prevent leakages to the ground.

However, even with such careful and most ample provision for the return current through the rails and insulated return feed wires or cables, a certain percentage of the current is, especially in moist earths, bound to leak through it to some other conductor, and the amount thereof will depend upon the combined resistance of the earth and conductor compared to that of the rail or other return circuit.

If this amount does not increase to such an extent as to make this conducting medium, be it water, gas pipe or cable, at any point, positive to either the rail or any other conducting medium, so as to cause the current to leave it, there would be no harm done, providing the conductivity of the pipe were uniform throughout and made continuous to the generator by an ample and perfect connection at some suitable point.

With a proper bonded rail circuit, reinforced by insulated return wires or cables from central points, such increase of current on any water pipe is not easily possible, as the resistance offered by the water pipe is very low, the metallic section of a six inch water pipe being one and one-half times that of a 70 pound rail, while that of an eight inch pipe is two and one-quarter, and of a 12 inch pipe three and three-quarter times as great; therefore, the perfecting of the circuit from the pipe to the generator in such cases is generally sufficient provision to protect the water pipe from electrolytic action.

But in all cases where the resistance to the current in the rails has not been reduced to a minimum, the proportion of the leakage becomes greater and, where the bonding is poor or imperfect, the resistance in the rail circuit becomes so great as to cause the water pipe to become the main return feeder, if not along the entire line, at least in many sections, and thus the pipe at many points becomes positive to adjacent or parallel conductors, at once establishing conditions which will produce electrolytic action, the extent of the destructiveness of which to the pipe will depend upon the low resistance offered by the earth and upon the amount of soluble salts, the electrolysis of which are injurious to the iron, that are contained therein.

The only question which may arise in connection herewith is as to the uniform conductivity of the pipe, whether there is sufficient resistance in the lead joints to cause some of the current to pass around and in doing so produce electrolytic action.

In a measurement made at the lead joint of an eight inch water main in front of the power house of the Milwaukee Street Railway Company, through which main 16 per cent of the entire output of the station (or 421 amperes) is being returned (31 per cent being the entire amount returned through the water mains), a drop of potential of but 0.0198 volt was found to exist between the ends of the pipe, indicating a resistance of 0.000,047 ohm, certainly not sufficient to produce electrolysis even with the most favorable conditions existing at the joint.

Corrosion at the joints, therefore, can only be caused by the electrolysis of the soluble salts heretofore mentioned, if they exist between the hub end and the adjoining pipe at the joint. A most careful examination of the pipes and the lead joint in the eight inch main above referred to did not show the least perceptible action of corrosion, although the main had been used as a conductor for years. It does not seem, therefore, that there is the least cause for any anxiety that corrosive electrolytic action may take place at the lead joints, and, hence, a water main of like diameter may safely be considered to possess a uniform conductivity throughout, and capable of conducting without injury so much of the current as under the law of divided circuits it cannot avoid conveying.

The eight inch water pipe, where the same is connected by a 500,000 circular mil cable to the generator, was subjected on either side of the connection and in under the clamps to a most careful scrutiny and examination, but, notwithstanding the clamp and cable had not been touched for 15 months, not even the least discernible change could be detected at any point. Where the iron pipe had been filed to form a contact with the clamp, the fine markings of the file were as sharp and distinct as on the day they were made. Other connections between the rails and pipe which were examined were found to be in equally good condition, and all possible information obtained so far indicates that all corrosive electrolytic action on or along the pipes has been arrested.

THE ANNUAL MEETING OF THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

THE MOST IMPORTANT FACTS CULLED FROM THE PROCEEDINGS.

BY DR. J. MOUNT BLEYER, OF NEW YORK.

[*Special for the Electrical Review—Concluded from page 168.*]

A paper on "Hydro-Electric Methods, Physics and Apparatus" was treated by H. Newman Lawrence, M. I. E. E. The author commenced by expressing regret that American physicians do not pay more attention to hydro-electric methods, and then proceeded to consider his subject under the following heads:

A. Apparatus required.

B. Current employed.

C. Methods.

D. The patient (considered electrically).

E. Problems.

Under heading A, typical apparatus, rather than special makes or systems, was described, and strong emphasis was placed upon the need for sound and reliable appliances well installed.

B. Batteries, dynamos and street mains were discussed as sources of supply of current. Methods were described by means of which the latter may be rendered perfectly safe, and the necessity for the adoption of reliable methods of control and regulation was pointed out.

C. Methods were classed as either dipolar or monopolar, and special stress was laid upon the value of the electric douche and its suitability for the electrization of the internal cavities of the body.

D. Under this head the resistance of the patient was considered, both apart from and in conjunction with the water. Authorities were quoted showing that the resistance of the body when immersed in the water is three or four times greater than that of the water alone.

E. The problems suggested as needing solution were: 1. What proportion of the total current reaches the patient in a dipolar bath? 2. What is the extent of advantage gained by placing electrodes in contact with the body under water, seeing that the latter is the better conductor and the current may radiate outwards from the edges and back of the electrodes?

This interesting and eminently practical paper concluded with an expression of the author's belief, as an electrician, that hydro-electric methods are worthy of close attention and study by the physician, and that they offer a most interesting field for investigation to the scientist.

Dr. Morrell demonstrated a new type of faradic apparatus. He claims the following points as most modern in its entire construction:

1. A fixed coil, in which the secondary is advanced completely over the primary, insuring in all currents employed the full induction development without regard to current strength.

This obviates all difficulty found in sliding coils and eliminates a source of annoyance to the patient and operator both. The coil is hidden in the case and permits the use of a plane surface vertical switchboard.

2. A compound fluid rheostat to control and regulate the secondary current. A primary rheostat and cell selector switch affords the usual means contained in ordinary batteries, but by the introduction of a completely controlling rheostat in the circuit of the induction current an unaltered electro-motive force is maintained in the primary to operate the break piece. The result is an unvarying steadiness and constancy of action impossible where the current strength is regulated by sledge coils and primary rheostats. Two tubes are furnished, one of higher resistance (over 1,000 ohms) for dosage in surface applications, and a lower resistance in a second tube for bipolar and other applications upon mucous surfaces. All other improvements up to date are also included in the battery.

A particular advantage gained by the use of the secondary current controller is the facility with which all switch and current changes may be made during any application without interrupting the treatment to exchange coils or return to a zero current. No shock is given to the patient, as the rheostats take up the excess flow of sudden fluctuations. This is not possible with any other battery yet made, and is of great practical merit in employing induction currents.

On induction currents an entire morning session was spent. Several papers were presented before the members by different contributors and on different subjects. "Physiological Effects," by Dr. W. J. Engelman, St. Louis; "Gynæcological," by A. H. Gœlet, New York; Dr. H. E. Hoyd, Buffalo; A. Lopthorn Smith, Montreal; and A. D. Rockwell, New York. Evidently, from the most able of them all, Dr. Engelman's is the most studied from every point. He spoke at length and in detail on his rapid controllable interrupter and precise muscle and nerve coils. He laid stress upon the new apparatus, because the faradic current, unlike the galvanic, depends altogether upon the generator for its character and efficiency, and the instruments in general use for therapeutic purposes have been such as to yield currents of limited value, without the possibility of varying their character, adapted to certain therapeutic purposes only, and imperfectly so at that, and differing from the other without means of record or comparison, so that even the most ingenious operator could derive but little positive benefit from their use, notwithstanding the satisfactory results occasionally achieved. The current was too vague and uncertain to be relied upon as a remedial agent.

He thought it needless at this time to insist upon the therapeutic importance of vibration or alternations, which is an accepted fact since Mr. Nikola Tesla has demonstrated the marvelous mechanical results of rapid vibration, and D'Arsonval has proven the surprising insensibility of the system to currents of extremely rapid alternations. These vibratory actions have been sufficiently demonstrated of late, and the varying effects of such vibrations of various mediums upon different nerves are the subject of physiological and therapeutic experiment. This increased rapidity of interruption and the ability to control gives a wide scope to the efficiency of the current, increases its sedative power and renders the application to the most sensitive tissues, especially decided vaso-motor effects being produced by it which are no longer perceptible to the sensory nerves. Whatever be the theory, whether it be true or not that the effect of the faradic current is mainly due to its mechanical influence upon the molecular constitution of the organism, the facts are that this variability, which is the very life and essence of faradic electricity, is likewise one of the most essential factors in determining its therapeutic efficiency.

Speaking of his new apparatus, he contrasted it with all other vibrators on faradic machines, which gave from 1,500 to 6,000 interruptions per minute. The Engleman machine gives 50,000 per minute. The interruptions are obtained from the commutator upon the axle of a small motor propelled by a two cell battery. By this additional contrivance are obtained interruptions of known rapidity and perfect regularity—the rapidity being limited by the size of the apparatus.

In order to settle the question of slow rates of vibration and of the high one obtainable by the spring vibrator—usually attached to all faradic machines—he and Dr. J. Mount Bleyer, of New York, settled this point. They found that an ordinary spring may vibrate 2,000 to 3,000 times per minute, 40 or 50 per second, and a better instrument at most from 4,000 to 6,000 per minute, or from 60 to 100 per second. To determine this with precision by a tuning fork is possible, but a difficult task for any but the skilled experimenter. The simple determination by the comparison of the note sounded is uncertain and subject to a most variable individual equation as well as other sources of error. Dr. Engelman's assertion was based on his own older Gaiffe instrument, which does not exceed 3,600, and on the comparison of results from the Waite & Bartlett spring vibrator with those from the controllable interrupter currents. Moreover, at the suggestion of Dr. Mount Bleyer, the lycopodium figures obtained upon the tense membrane by the vibrator, and known rates of the new interrupter have been used as means of comparison, and by reference to the results obtained by these three methods the rates of vibration have been determined with approximate certainty.

Many physiological problems were brought up and founded on ripe researches, which bore out his statements. It is very evident from what we have seen and heard that the methods thus presented to us and the new use of high vibratory action has undoubted therapeutic value which must be highly commended upon. His physiological effects with the different coils and their different sizes of wire were given in every detail. He shows how motor, nerve, and stimulating and general nerve and muscular effects are gotten by the size, wind and length of wires in his coils.

At the exhibit several apparatus are worth brief mention — the static machine of Dr. Newton and another excellent one of the Wait & Bartlett make both of which, no doubt, have great merit. Each one has its own. Many novel electrodes for all therapeutical purposes were on show and surnamed after each therapeutist. A very novel current controller made by the McIntosh Battery Company, of Chicago, was worth inspection. This one is designed for portability. The novelty and safety of this controller lies in a delicate fuse which is constantly in the machine circuit, so placed that all the current traverses the fuse before it reaches the point where the patient's circuit joins the machine circuit. This avoids all possibility of a dangerous increase in the current strength in the patient's circuit. The fuse is so adjusted that a current of one-half an ampere in the machine circuit would instantly melt it and thus disconnect the instrument entirely from the dynamo. Other useful and excellent attachments are comprised in the construction of this controller which warrant its mention here.

The finalé of the assemblage wound up on Thursday, the last day of the session, at Mr. Nikola Tesla's laboratory, who gave the most scientific exhibition of his world-renowned experiments.

Friday at 10.30 A. M. an excursion to Mr. Thomas A. Edison's laboratory was made by a special car fitted out for the large party present. Everything worth seeing at the Wizard's pantheon was trotted out and dissected to the hungry eyed and eared. The kinetograph and phonograph were the principal entertainers, and not least Mr. Dickson, who showed all attention becoming that gentleman. Toasts were offered up to the Wizard and responded to by his proxical representative Mr. Dickson. The lunch was served in the library, and was devoured in a way which is an air of appreciation in the right hour. Parties of four and six were seated together at tables arranged between the book stalls, a very novel idea. The Wizard never does things half way—he believes in the French adage, "*tout au rien.*" On the homeward bound train the parting hour struck, and most of the out-of-town physicians took their leave, equipped with a full store of electrical supply. The next meeting takes place in Toronto, Canada, 1895.

An Electric Salesman's Clever Dodge.

One of the best known men in the electrical field told me recently of the manner in which he evaded a very serious question put to him in the infancy of his electrical experience, and when he did not know an armature from a bootjack. The competition this time was between the Brush arc dynamo and a Thomson-Houston. The representative of the former had advised the purchaser that the Brush machine had separate bobbins wound on the armature in such a manner that any one could be repaired in very short time by simply rewinding that particular bobbin without interfering with the other, whereas the Thomson-Houston armature was so complicated that if any wires should become defective which were several "layers" down, the whole exterior would necessarily have to be removed.

When my friend who represented the Thomson Houston company was asked to explain this apparent defect in the construction of their armature he was nonplussed for a reply, as he had never seen both armatures together, and at that time did not know anything about the construction any way—in fact, was a greenhorn as far as detail was concerned. After hesitating a few minutes, he replied (I wonder what particular god he worships?) that an explanation was very easy. The Brush dynamo was expected to and actually did burn out very frequently, hence provision for taking care of such an abominable occurrence, while the Thomson-Houston never burned out—in fact, owing to the design that was impossible, and, therefore, the company had no need to arrange to take care of rewinding. For this brilliant piece of truth (?) the Thomson-Houston party received the order for the plant.—*F. A. Scheffler, in Cassier's Magazine.*

MORE TROLLEY SENSATIONALISM.

A NEW YORK DAILY PAPER SENDS A YOUNG WOMAN ON A FOOL'S ERRAND.

The New York *World*, which has been endeavoring to hurt the trolley system of electric railways by sensational attacks of peculiarly innocent and child-like originality, has once more made itself a laughing stock among street railway men. In a recent Sunday issue this paper published the illustration reproduced on

TROLLEY SENSATIONALISM—MEG MERRILIES AND THE CAR FENDER.

this page. The cut is *not* from the *Police Gazette*. The headlines of a page article were in part, as follows:

"Faced Death Before a Trolley Car. Miss Meg Merrilies Makes a Practical Test of the Newest Car Fender to Save Human Lives. Falls Into the Net While the Car Plunges On."

The ELECTRICAL REVIEW has before taken occasion to quote this young woman's hysterical remarks and below will be found further frothings from her badly twisted quill.

"I have made a practical test of the newest life-saving device for the deadly trolley car. I have faced possible death to find out if any contrivance could be made that would really put a stop to the shocking list of victims.

"Street car officials have told me that none of these life-saving appliances were of any value. I didn't believe them. So I have tried one as a sample, and I believe there may be others that are even better than the one I tried.

"I made my test in the only practical way—by just standing right in front of a trolley car moving at a rapid rate and allowing myself to be struck with the fender.

"In doing this my life was in danger at the instant of contact, but I received the blow and escaped without any injury.

"I plunged headlong into the net, was quickly picked up and carried along until the car came to a full stop.

"I was bruised, but not severely enough to cause any great pain. So far as could be judged from a single experiment, with the motorman and the person struck both conscious that the fender was on trial, the test was successful.

"The fender upon which I experimented was attached to a trolley car on the Atlantic Avenue Railroad, and the test took place last Thursday in Brooklyn.

"The fear of the trolley also affects real estate. The real estate men report that they find it a difficult thing to rent or sell houses on the line of the trolley cars."

The ELECTRICAL REVIEW might believe that Meg Merrilies really did fall gently into the net, with the connivance of a motorman, as she states, if the picture did not show a Broadway cable car with the net attached. How a New York cable car can operate on a Brooklyn trolley line is a matter for speculation and one which leaves the reader in doubt as to the genuineness of the whole story.

A meeting of the stockholders of the Goshen, N. Y., Electric Light and Power Company for the election of directors was held recently. The necessary quorum not being present, the old directors hold over, as follows: J. W. Corwin, W. H. Wyker, Jos. Merritt, J. W. Gott, W. M. Sayer, Henry Youngs and Arthur Pell, M.D. The officers of the company are: President, J. W. Corwin; vice-president, W. H. Wyker; secretary and treasurer, Dudley Murray.

Westinghouse Sues Fort Wayne on a Meter Patent.

The Westinghouse Electric and Manufacturing Company has brought suit against the Fort Wayne electric corporation. It is a suit for infringement of a patent on a meter for alternating electric currents, and the court is asked to enjoin the defendant company from manufacturing and using the apparatus and to require it to pay over all profits from the use of it.

Becoming Impatient With Mr. McMillan.

The *Boston News Bureau*, of recent date, says:

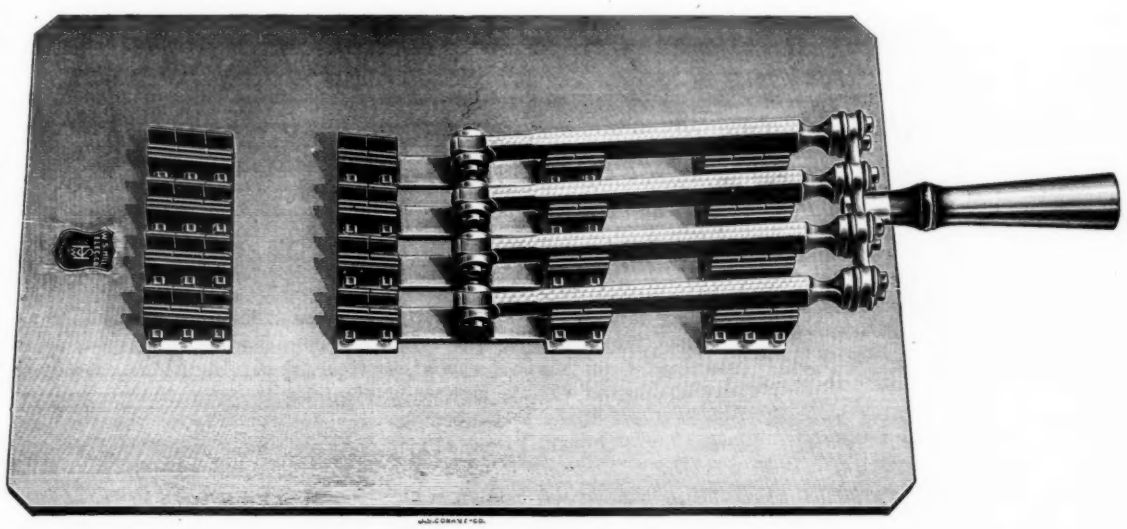
"It is announced that a meeting of the stockholders and creditors of Detroit Electrical Works is to be held in Detroit, October 15, to plan a reorganization. If Mr. McMillan would kindly keep his Detroit electrical plant and operate it himself without further bothering eastern stockholders he would confer a favor upon a much abused investing public."

W. S. Hill Electric Company's Heavy Current Switches.

The illustration herewith shows the new switch manufactured by the above company for railway and central stations. For the past year these switches have been in use in very large numbers, one power station alone having over 300 in use of from 500 to 4,000 amperes capacity.

The improvements (which are covered by patents) consist in broadening the ends of the blades and yoke so as to admit of using two bolts; this unites the two so firmly that it prevents all twisting or straining of the parts while the switch is being operated.

The method of backing up the flexible brush contacts by plates of pure copper practically converts the blade and contacts into one continuous piece of metal, and as the size of all the carrying parts are computed at 1,000 circular mils per ampere, it will be seen that perfection has been attained. The company reports business good in all its lines, but more especially brisk in switchboards, some of the largest and finest ones in the country having been lately turned out.



W. S. HILL ELECTRIC COMPANY'S HEAVY CURRENT SWITCH.

The Hammond Cleat and Insulator Company's Rosette Cut-out.

The illustration on this page shows the latest in rosette cut-outs manufactured by the Hammond Cleat and Insulator Company, of Boston, Mass. A glance at the cut will show the salient features of the device. The body of the rosette is in one piece of thorough y vitrified glazed porcelain,

HAMMOND CLEAT AND INSULATOR COMPANY'S ROSETTE CUT-OUT.

with an absolutely solid back through which no moisture can possibly get to the contacts. The feed wire contacts are as shown, and the lamp cord connections are just inside, above the fuse slide opening. The fuses are carried on an interchangeable slide which renders the insertion of fuses very easy and simple. These are the most prominent points of advantage, but there are many others which the Hammond Cleat and Insulator Company will be pleased to demonstrate upon application.

The New Brooklyn Telephone Company.

The bonds of the New York and Eastern Telegraph and Telephone Company, which recently got a franchise from the Brooklyn aldermen, have been approved and it will begin work at once. The company agrees to pay the city one per cent of its gross receipts every six months; to furnish the city with telephone service at a price not exceeding $40 per year for each instrument, and to furnish the general public at a price not to exceed $75 per year. There is a question as to the validity of the franchise, and the matter will probably be referred to the courts.

The Wilkesbarre Telephone Company is reconstructing its line through Parsons, Pa., taking down the old poles and replacing them with new ones.

ELECTRIC LIGHT FLASHES.

The people of Salem, Mo., voted down an electric lighting proposition by a vote of two to one.

The electric light commissioners of Reading, Mass., are so busy that they have no time to report progress.

A company proposing to furnish light to the city of North Platte, Neb., asks a franchise for a term of 15 years.

The Brush Electric Light and Power Company, of Savannah, Ga., has about completed the erection of a 150 feet steel plate chimney at its new plant on Indian street.

A firm of real estate agents at Los Angeles, Cal., offer as an inducement to purchasers in their addition to Ontario before January 1, 1895, free electric lights for one year.

The electric light plant at Carrollton will be moved to Perry, Oklahoma. The Carroll County *Times* is urging the citizens to keep the plant. It will be no light matter for the Carrolltonians to lose it.—*Rome, Ga., Tribune.*

The plant of the Lambertville, N. J., Electric Light, Heat and Power Company has been sold at private sale by E. R. Solliday, receiver, to D. Stuart Robinson, of Philadelphia, for $10,050, clear of encumbrances.

Syracuse, N. Y., is paying 30 cents a night for each electric lamp, or $109.50 a year. The contract will soon expire and she expects to get reduced rates. The electric company intimates that she is more liable to get an increased one.

The comparative earnings of the Edison Electric Illuminating Company, of New York, for September were as follows:

	1894.	1893.	Increase.
Gross	$101,030.55	$86,931.00	$14,099.55
Net	48,606.71	44,195.22	4,411.49
Nine months:			
Gross	967,389.19	852,219.72	115,169.47
Net	502,964.58	384,870.15	118,094.43

That there is an earnest desire for electrical knowledge on the part of all classes, the following received at this office from Indiana is special evidence:

have you Bok Showing how to opirate the tomashusting art light lamp of Chicago Company.

The Olympia, Wash., Council will enter into a new contract with the Olympia Light and Power Company for lighting the city for another year. The rate now paid is $11.50 per month for 44 arc lights. On this the company allows a rebate of 10 per cent during the depression.

The Citizens' Electric Light and Power Company, of Pensacola, Fla., lately organized, have just let the contracts for a substantial brick building for their plant and the poles for their wires. The contracts for the machinery were given out two or three weeks ago. Everything is to be completed so that the plant will be in operation by December 1. The electric plant will consist of a 1,500 light incandescent dynamo and a 100 arc light dynamo. The principal stockholders in the new company are the fish dealers of the city, and as they are large consumers of ice, the company will add ice manufacturing machinery to the electric plant.

ELECTRICAL HAPPENINGS.

A. B. Harford, of Detroit, is the latest inventor of an automatic exchange switchboard.

The loss to the Erie Telegraph and Telephone Company at Little Rock, Ark., by the recent cyclone will not exceed $1,000.

The new telephone company, at Grand Rapids, Mich., claims to have secured two-thirds as many subscribers as the old campany has.

Mayor Shaw, of Trenton, N. J., has declined to carry out the instructions of the Common Council to stop the cars of the electric railway company until the company grants five cent transfers over its lines.

At a recent meeting of the St. Paul, Minn., Council, the Northwestern Telephone Exchange Company asked for an extension of its franchise. The franchise expires in November, and the company asks for an extension of 15 years. No action was taken.

Engineer Hall, representing the promoters of the proposed electric railway between Washington and Baltimore, will immediately commence surveys with a view to establishing a permanent line from Riverdale to the District of Columbia line, where the road will connect with the Eckington and Soldiers' Home system at the terminus of Rhode Island avenue extended.

The second annual reunion of the Southern New England Telephone Company's Employés' Mutual Benefit Association was held at New Haven, Conn., on October 1. The following officers were elected: W. A. Hurd, of Hartford, president; E. A. Smith, Meriden, vice-president; F. P. Lewis, New Haven, secretary; and A. H. Embler, of New Haven, treasurer. The following directors were elected: G. W. Hoyt, Danbury; W. N. Sperry, Waterbury; E. M. Clark, New Haven; H. T. Lohmes, Hartford; E. B. Baker, New Haven.

The New Haven Car Registers.

The registers manufactured by the New Haven Car Register Company are in great demand in street railway circles, as is shown by the large number of sales made to street railway managers. Many of the largest companies in the country are using these registers. Among the numerous customers are numbered the Philadelphia Traction Company; the North Hudson County Railway, of Hoboken, N. J.; the Rochester Railway Company; the Oakland Railway of California, and many other large systems in the United States, including the Consolidated System of Atlanta, Ga., which have just adopted these machines, also the owners of the street railways in Montreal, Toronto, London and in other large cities in Canada.

The registers are attractive, the cases made of solid bronze of ornamental design, highly polished and finished. The registering devices are of the numeral type, three sets of numerals being exposed, one for the trip, the second the total number of fares collected on each trip, and the third for totalizer, which records to 100,000. The figures are black on a white ground and can be readily seen from any part of the car. Good evidence of the value of these registers is shown from the fact that the highest and only medal and diploma awarded on stationary fare registers at the World's Columbian Exposition was given to the New Haven Car Register Co.

This company propose also to put on the market both double and triple machines for registering separately different denominations of fares, or fares and transfers, and will exhibit at the Atlanta convention a machine which will not only register, but also totalize separately three different classes of fares, or two fares and a transfer. This register is undoubtedly destined to meet with ready recognition at the hands of the leading railway men everywhere, and the company state that they have already received requests from several prominent street railway managers who desire to adopt this device on their lines.

This company is a highly successful one and their reliable work is appreciated throughout the entire field.

THE NEW HAVEN CAR REGISTER.

MODERN TRACK BUILDING.

A FINE PIECE OF ELECTRIC RAILWAY TRACK CONSTRUCTION.

Belden & Seely, railroad contractors of Syracuse, N. Y., have been doing some very fine track construction for the Syracuse Street Railroad Company. Their method of working will doubtless be of interest to street railway men. A brief description follows:

First, a trench is dug 21 inches in depth and 18 feet in width, accommodating two tracks. In the bottom of this trench there is laid six inches of broken stone. The stone is rolled with an eight ton roller, making a uniform thickness of rolled stone of five inches. Upon this foundation sawed white oak ties, six inches by eight inches by seven feet long, are placed two and one-half feet from centers to centers. On the ties are 90 pound girder rails spiked to the ties with standard New York Central Railroad spikes, and tie rods are placed every 10 feet. The rails are connected together at their joints with a 32 inch fish plate and 12 one inch bolts. The joints are all mad: perfectly tight. The ties are tamped with screened gravel and are filled in between with gravel and rolled with a hand roller. On this filling is placed six inches of concrete, and upon the concrete two and one-half inches of asphaltum pavement. Each side of the rails is lined with sand stone blocks, placed alternately, headers and stretchers. The track is lined up with a transit and the contractors have every reason to believe that this is the best piece of railroad construction in the United States. Belden & Seely are constructing six miles more of double track in this manner for the same company.

The Modern Trust.

Two men who had found an oyster which each of them claimed as his referred their dispute to a lawyer, who ate the oyster and awarded them a shell apiece. Immediately they organized the great oyster shell trust, issuing $10,000,000 debentures, secured by a first mortgage on the shells, retained the lawyer as their legal adviser, purchased several senators and lived happy ever afterward. Moral: Do not throw away the shells, even after the lawyer has eaten the oyster.—*Boston Transcript.*

A New Law Firm.

Mr. Chas. N. Morgan, a leading corporation lawyer of this city and well-known in electrical circles, has recently formed a new firm to be known as Morgan, Murray, Bennett & Ingersoll, whose offices will be in the Farmers' Loan and Trust building, 16–22 William street, New York.

LITERARY.

In the New York *Polyclinic* for September 15, 1894, Messrs. Houston and Kennelly have a very interesting and instructive article entitled "Modern Views on the Physics of Electricity as applied to Electro-therapeutics."

"Practical Notes on Rope Driving," by the Street Railway Publishing Company, has been received. It is full of information, is just what it pretends to be, and all interested should get a copy. Price, 50 cents. Supplied by the ELECTRICAL REVIEW.

Scribner's Magazine for October contains the first of two articles on English Railways by H. G. Prout, editor of the *Railway Gazette*. Colonel Prout recently made a trip to England expressly for the magazine, to accumulate fresh material on a subject with which he was already familiar.

"Electric Lighting Plants," by W. J. Buckley, an experienced electric light man, has been received. It is published by the Wm. Johnston Printing Company, Chicago. The cost and operation of electric light plants are interestingly and ably discussed by Mr. Buckley, and the book is a timely and, we think, reliable publication. The author announces that his book "is to give to intending purchasers such details as may aid them in forming a fair estimate of the cost of construction and operation of their proposed station."

Mr. Buckley is a salesman of the Fort Wayne Electric Corporation, and has, in "a noble effort to deserve his salary," mentioned only the Wood lighting apparatus, stating that in all other ways impartiality has been observed. Details are given of the cost and efficiency of fuel, oil, labor, boilers and engines (with tables and diagrams of power, prices, etc.), dynamos, arc and incandescent lamps, the various instruments used and the wiring. Tabular statements of the cost of operating municipal and private plants in a large number of cities are given. The following is an extract from the introduction:

"A careful analysis of the reports shows that while the cost of fuel and labor varies, according to locality and facilities, the cost of production of light and the revenues derived therefrom adhere to a general average. The reports indicate that the electric lighting station, if properly managed, offers opportunities for large returns on the investment; but, perhaps more than any other business, affords unlimited chances for numerous small leaks, which, taken in the aggregate, will soon equal the revenues derived, unless carefully drawn within the limit of unnecessary expenditure. Of the operating stations, 12.6 per cent are losing money; with 10.8 per cent the receipts barely cover running expenses; while 76.6 per cent are making money, ranging from two per cent to 51 per cent yearly on the investment."

"Electricity at the World's Columbian Exposition," by Prof. J. P. Barrett, chief of department. 501 pages, profusely and elegantly illustrated. Cloth, gilt stamping, price, $2.50. Supplied by ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York city.

Professor Barrett has well performed the work of a compiler, and in this book has given us something that will always be a reminder of the great glory won by electricity at the grandest exhibition the world has known. The illustrations, especially those of electric lighting effects at night, are finely executed.

The following piece of fine writing follows the title page:

"Tipped with golden domes, touched with the pomp of Asia, in the midst of the White City, beside the gleaming waters of Lake Michigan, looking upon the rippling lagoon and the dazzling fountains of the ideal Venice that in the heart of America is the radiant shell of the Columbian World's Fair, one of the exhalations of that wonderful frozen dream, whose exquisite hues and airs and lines are a picture in which genius has been prodigal, and where are gathered the glories and mysteries of human achievement, rises the Electrical Building, stored with the most marvelous of the marvels of the age.

"The Fair, considered as an electrical exposition only, would be well worthy the attention of the world. Look from a distance at night upon the broad spaces it fills and the majestic sweep of the searching lights, and it is as if the earth and sky were transformed by the immeasurable wands of colossal magicians; and the superb dome of the structure, that is the central glory of the display, is glowing as if bound with wreaths of stars. It is electricity! When the whole casket is illuminated the cornices of the palaces of the White City are defined with celestial fire. The waters that are at play leap and flash with it. There are borders of lamps around the lagoon. The spectacle is more resplendent than the capitals of Europe ever saw when ablaze with festivals to celebrate triumphant peace or victorious war."—*Murat Halsted in Cosmopolitan.*

Mention of this journal is made in the book as follows:

The ELECTRICAL REVIEW, of New York, was founded by Mr. George Worthington, in February, 1882, and was the first weekly devoted to electrical interests published in the United States. Mr. Worthington remained as editor of the REVIEW until his death in February, 1892, just 10 years after the first number appeared. The development of the REVIEW has been co-incident with that of the electrical field. At the time the journal was started matters electrical were in a rather chaotic and undeveloped state. It has, doubtless, been a great mutual benefit to the electrical industry and the ELECTRICAL REVIEW to have developed side by side, each helping the other. It is estimated that there are $800,000,000 invested at the present time in the electrical industry in this country, and the ELECTRICAL REVIEW has always presented a faithful and accurate account of this development. As an interesting, influential and independent publication the REVIEW has always occupied an enviable position and is recognized as one of the leading class journals of this country. Its headquarters in Electricity Building, where files of the paper and pictures of eminent electricians were exhibited, were visited by large numbers of electrical people of this country and Europe. A consistent advocate of the World's Columbian Exposition and zealous in advancing the interests of electrical exhibitors, the REVIEW has, at all times, been of material aid to this department.

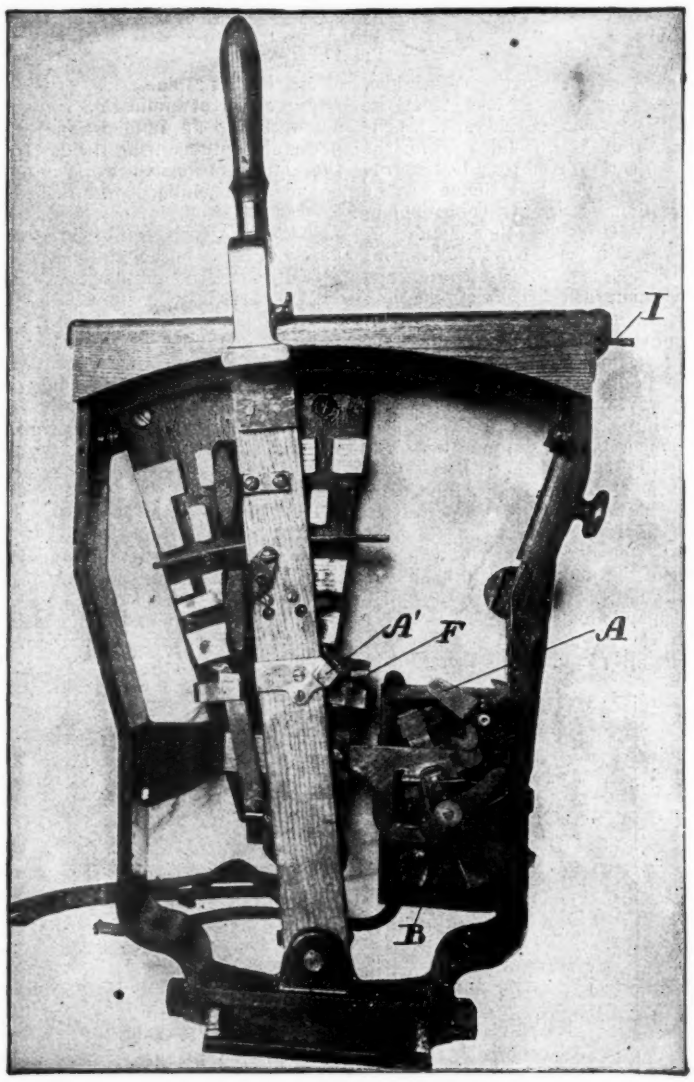


FIG. 14.

THE ELECTRIC BRAKE IN PRACTICE.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK AND CHICAGO, SEPTEMBER 19, 1894, BY ELMER A. SPERRY.

(Concluded from page 177.)

As to the arrangement for application and control of the brake by the motorman, about a year ago the following appeared from the pen of the author:

"Considering the inexperience of the operator and the responsibility, which at times well nigh overwhelms him, I think that, as engineers, we should be willing to set a very high mark to be attained in the ideal brake for electric street railway service, namely, the use of but a single controlling handle for everything; starting, accelerating, retarding and braking the trailer, or trailers and all. Let the motorman have nothing to think of except one handle, and two-thirds of the accidents now occurring will be prevented. Let this handle require no more exertion in its operation than the present controlling handle. Let the motorman fulfill his function with as little physical exertion as possible; he will then have a greater reserve for mental application when necessary. A motorman required to exert an enormous amount of brute force, constantly grinding at the brake, has but little life left to apply in case of emergency. I agree with a prominent writer on this subject, where he says that a multiplicity of handles is fatal in time of emergency."

At the time the above was written, equipments controlled as therein set forth, namely, by the use of a single controlling handle for everything, had been in operation for upwards of a year. The methods employed for accomplishing this have been varied, but the form most in use at the present time is that shown in Fig. 13, where the resistance contacts are employed in a two-fold manner; the controller handle is made to operate back and forth over the same contacts for controlling both the application of the current to the motor and braking the car. A self-correcting and interlocking device is also provided, shown at A, A', Fig. 14, so if the motorman does not throw the handle clear over, the transformation is completed automatically before the movement of the lever can reach the operating contacts.

At one point where a number of equipments were started last Summer a newspaper correspondent described the operation of the brake as follows:

"The connecting beam was taken from the trolley wire several times and the car brought to a sudden stop, with the electric brake alone, within three-quarters of a car length. And it was not a sharp, jerky stop, but something as if the car had run into a big feather tick."

The smoothness of even a sudden stop by the electric brake is quite aptly described by this droll statement. It seems as though the car was running into an air cushion.

It will thus be seen that the brake is automatic and does its work without any special act or even the knowledge of the motorman. He simply "works a single handle" back and forth and electricity "does the rest." Suppose the motorman wishes to stop his car; he turns off the current by simply swinging the lever over to the right. This operation is made to automatically convert the motor into a special dynamo for generating currents at very low speeds, and also simultaneously to cut off all connection with the trolley current. The brakes are then applied by simply swinging the handle back

over the path it has just traversed; the farther it is swung to the left, the stronger the brakes are applied. The act of releasing or letting off the brakes again automatically re-establishes connection with the trolley and reconverts the dynamo into a motor. Fig. 15 shows the switches used in part for the conversion of the motor, and also the finger F mounted upon the lever forming a part of the alternate stroke operating device. The trolley brake switch B is shown open in Fig. 14 and closed, with dimensions, in Fig. 16. The same rheostat and contacts are applied to control the motor while running the car, and also to control the slight amount of current generated by the transformed dynamo which is sufficient to brake the train.

The motorman cannot turn on the current before the brakes have been released, nor can he apply the brakes before the current has been turned off. This is a result of construction, and constitutes a feature of merit in the new electric brake, effecting an economy in current and a saving in wear and tear. Freeing the conductor of all care in this connection, and leaving the braking of the train—including trailer, or trailers

Fig. 13.

and all—solely in the hands of the motorman by placing at his command a power with which he may with the utmost ease accomplish his task, constitutes an important advance in the art of control of electric railway equipment.

It has been found that the electric brake is practically incapable of abuse by any motorman, an advantage which never before has been attained in any power brake, due to the fact above named, that no amount of over-application can cause flattening of the wheels, or any harm whatever to any part of the equipment through their locking and skidding.

The application of the brake, its regulation and also the running of the car, all by a single operating handle, is a result that has only been accomplished by the closest application. It has involved much pioneer work, and been rendered possible through the use of new mechanical movements original with the writer. The principal moving parts are simple and durable, being only two in number. The arrangement may be easily seen in the controller and parts exhibited, as well as in Figs. 14, 15 and 16. The various portions of the controller have been subjected to the severest tests possible, one test made in 1893 consisting in 518,700 consecutive brake applications without appreciable wear, the parts being in direct proportion to the complexity and number of parts.

The advantages found to result from the practical use of the electric brake as compared with former brake systems, its qualities as an accident preventer, as well as its general commercial value, may be recapitulated as follows:

regular service at the present time. An indicator at the right side of the controller at the top (see I, Figs. 13 and 14) shows when the controller is in condition for brake, or is being so used.

Operating the brake in this manner, it will at once be seen that the system is one of the utmost certainty of operation, surer even than the hand brake, air or other power brake, from the fact that every time the car runs, the motor, which is depended on for the braking action, receives a test and its fitness and capacity for the next brake application is constantly being demonstrated. On the other hand, the motorman never knows whether his hand brake is sure to operate when called upon for the next application. An accident came under the observation of the writer on Case avenue hill, in Cleveland. Here the last hand-brake application was successful in every way, but before the brake was called into action again, a nut dropped off from a brake rod upon the truck, rendering the brake useless. The motorman continued to wind on his brake staff, and before he realized what the trouble was his car was going at a tremendous speed into a short curve at the foot of the hill. There were a number of casualties and also six demands for damages as a result. With the air or other power brake, this liability to failure is increased in

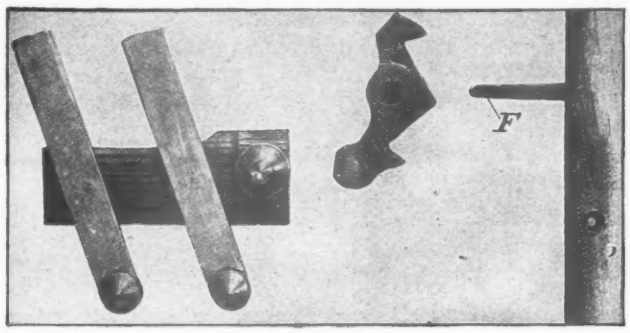


Fig. 15.

1. The certainty of its operation.
2. The enormous power at instant command and under perfect control.
3. The absence of all power absorption at moneyed cost from the central station.
4. Its high efficiency, being far superior to compressed air; amply proven in numberless instances where electricity has replaced air. (The air requires a direct application of energy, amounting to an immense aggregate power absorption during the day from the central station; the working parts of the air machinery are attached to the car axles and require a large quantity of energy, not only while compressing, but at other times as well.)
5. Its extreme simplicity.
6. Observed saving in wheels, two to three-fold.
7. Entire saving in brake shoes.
8. Lubrication of brake face; very little wear of either wheel or magnet.
9. Absolute silence of operation and release. (No hissing to frighten horses on streets.)
10. The low electro-motive force at which it operates.
11. The ease of its application and control.
12. Conserving strength and prolonging the usefulness and life of the motormen.
13. The smoothness of its operation.
14. The fact that its use cannot cause flat wheels.

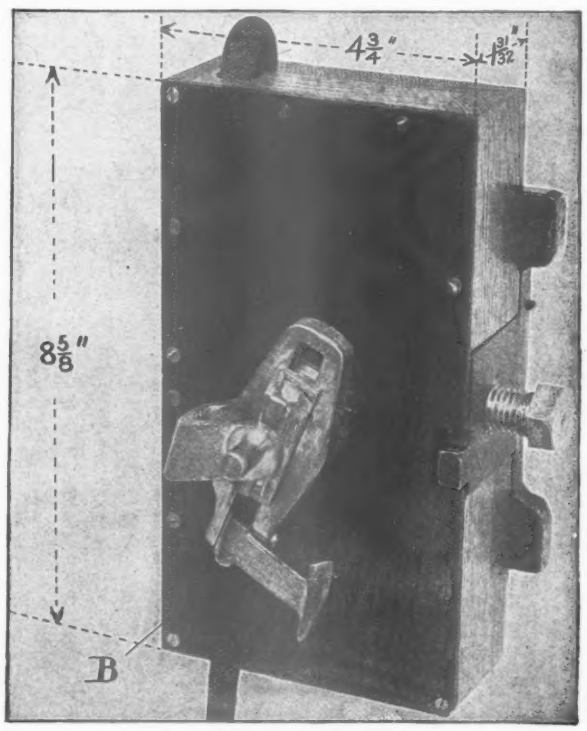


Fig. 16.

A Novel High Frequency Incandescent Lamp.*

In order to produce rationally and economically light effects, the writer states it is necessary to tune the primary and secondary circuits so that their vibratory period is expressed by the formula $T = 2\pi\sqrt{LC}$. (L meaning self-induction of the secondary circuit; C, capacity of the condenser.)

The use of air, or oil condensers, is preferable to apparatus with solid dielectric. As the logarithmic decrement of electrical vibrations is given by the formula $\pi R\sqrt{C : L}$, condensers of small capacity should be employed; while for a given ohmic resistance, R, the inducing circuits should possess the greatest admissible self-induction. Of course, on account of the high frequency ($n = 10^7$), self-induction must be low, or else the apparent resistance would exceed all limits.

Starting from these theoretical considerations, M. Ebert instructed Mr. Böhner, of Erlangen, the well-known electro-mechanic, to build an apparatus for the production of light by high frequency currents. After many trials M. Böhner constructed an apparatus, called "Luminescenzlampe," phosphorescing lamp, consisting of a glass bulb, into which projects a glass rod which carries at its end a small disk, to which is attached a little paste of what is known in the trade as "greenish-blue light color," manufactured by Th. Schuchardt, of Görlitz. Two tinfoil bands surround the bulb near its largest diameter, and by means of small hooks the conductors from the high frequency circuit are attached thereto.

As soon as the tinfoil bands are affected by the electrical vibrations or oscillations, numerous vertical, but very faintly luminous cathodal, rays are formed on the inside of the bulb. But, as all these rays are focused upon the disk bearing the luminous paint, they quickly produce a bright phosphorescence, and these light rays emerge from that part of the bulb which is not covered by the tinfoil bands.

According to accurate measurements, the light represents one-fortieth to one-thirtieth of an amyl acetate unit with a consumption of energy 1,500 to 2,000 less than that required for lighting the standard amyl acetate lamp. (The light unit of Hefner Alteneck consists of a free flame which rises from the cross section of a massive wick saturated with amyl acetate, which fills a circular German silver tube, 8 millimeters inner and 8.2 millimeters outer diameter by 25 millimeters in height. The height of the flame from the wire tube measures 40 millimeters.)

As stated above, the light is a mixture of greenish-blue and yellow, but M. Ebert is now trying to find means for suppressing the greenish-blue portion; in other words, he is attempting to produce but the yellow light. If he succeeds in his work we shall have a high frequency incandescent lamp equal in power to the light produced by a gas or coal oil lamp. Indeed, he thinks it possible to construct in this manner lamps of considerable lighting power, consuming, however, only one millionth watt. The fact that high frequency currents, on account of the great self-induction of the circuits, cannot easily be transmitted over long lines need not be considered a serious obstacle, as it is easy to construct a small device forming the socket of the lamp which shall act as a transformer of electrical energy into high frequency currents.

V. M. B.

* Experiments by H. Ebert-Wiedem, An. Vol. 53, 1894, p. 144.